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Dillon West Unit
Part 2

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Dillon Resource Area resources inventory



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Everson Creek Basin

The Everson Creek sample basin was visited a total of 16 and 15 times during the two hydrologic years. Bad weather and poor road conditions made the basin inaccessible on several occasions. The upper North Everson station was monitored 10 and 11 times respectively.

Channel Stability Ratings

The North Everson Creek and South Everson Creek stream sections were evaluated on September 3, 1976. Each segment extended from the lower station to just above the Beaverhead National Forest boundary. North Everson Creek was rated as 'good' (76) (Table 15) and South Everson Creek as 'good' (74) (Table 16).

Precipitation

Precipitation was measured at the South Everson precipitation station from April 23 through November 11, 1977 and from June 15 through September 14, 1978. This station was intermittently inaccessible owing to bad road conditions and locked gates. The general precipitation patterns during these two fiscal years are compared to those of the Dillon and Lima weather stations (Figure 66). Sampling problems at the South Everson stations during the 1978 field season preclude any comparative analysis.

Stream Discharge

The staff-discharge rating curves for the Lower North Everson, Upper North Everson, and South Everson sampling stations are presented in Figures 67-69. The gauging sites remained relatively stable during the sampling period, although the spring flood of 1978 did result in some channel adjustment.

The 1977 and 1978 annual hydrographs for the Everson Creek sampling

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Table 15

R-1 STREAM CHANNEL STABILITY FIELD EVALUATION FORM

North Everson

9/3/76.

Item Rated		Stability Indicators by Classes				
I. UPPER BANKS		EXCELLENT	GOOD	FAIR	POOR	
Landform Slope	Bank slope gradient <30%. No evidence of past or potential for future mass wasting into channels.	(2)	Bank slope gradient 30-40%. Infrequent and/or very small, mostly healed over. Low future potential.	(4)	Bank slope gradient 40-60%. Moderate frequency & size, with some raw spots eroded by water during high flows.	(6)
Mass Wasting (Existing or Potential)	Essentially absent from immediate channel area.	(3)	Present but mostly small twigs and limbs.	(4)	Present, volume and size are both increasing.	(5)
Debris Jam Potential (Floatable Objects)	90% + plant density. Vigor and variety suggests a deep, dense root mass.	(2)	70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass.	(6)	50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	(9)
Bank Protection from Vegetation		(3)		(4)		
II. LOWER BANKS						
Channel Capacity	Ample for present plus some increases. Peak flows contained. W/D ratio <7.	(1)	Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8-15.	(2)	Barely contains present peaks. Occasional overbank floods. W/D ratio 15-25.	(3)
Bank Rock Content	65% + with large, angular boulders 12" + numerous. Rocks, old logs firmly embedded. Flow pattern of pool & riffles stable without cutting or deposition.	(2)	40 to 65%, mostly small boulders to cobble 6-12". Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm.	(4)	20 to 40%, with most in the 3-6" diameter class. Moderately frequent, moderately unstable obstructions & deflectors cause bank erosion yearlong. Sed. traps full, channel migration occurring.	(6)
Obstructions		(2)		(4)		
Flow Deflectors						
Sediment Traps						
Cutting	Little or none evident. Infrequent raw banks less than 6" high generally. Little or no enlargement of channel or point bars.	(4)	Some, intermittently at outcrops & constrictions. Raw banks may be up to 12". Some new increases in bar formation, most from coarse gravels.	(8)	Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident. Moderate deposition of new gravel & coarse sand on old and some new bars.	(12)
Deposition		(4)		(8)		
III. BOTTOM						
Rock Angularity	Sharp edges and corners, plane surfaces roughened.	(1)	Rounded corners & edges, surfaces smooth & flat.	(2)	Corners & edges well rounded in two dimensions.	(3)
Brightness	Surfaces dull, darkened, or stained. Gen. not "bright". Assorted sizes tightly packed and/or overlapping. No change in sizes evident. Stable materials 80-100%.	(1)	Mostly dull but may have up to 35% bright surfaces. Moderately packed with some overlapping. Distribution shift slight. Stable materials 50-80%.	(2)	Mixture, 50-50% dull and bright, ± 15%, ie 35-65%. Mostly a loose assortment with no apparent overlap. Moderate change in sizes. Stable materials 20-50%.	(3)
Consolidation or Particle Packing		(2)		(4)		
Bottom Size Distribution		(4)		(8)		
6 Percent Stable Materials						
Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition.	(6)	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	(12)	30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	(18)
Clinging Aquatic Vegetation (Moss & Algae)	Abundant. Growth largely moss like, dark green, perennial. In swift water too.	(1)	Common. Algal forms in low velocity & pool areas. Moss here too and swifter waters.	(2)	Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	(3)
COLUMN TOTALS		2	48	22	4	4

Add the values in each column for a total reach score here. $(2 + 48 + 22 + 4 = 76)$.

Reach score of: (36-Excellent, 39-76-Good, 77-114-Fair, 115-Poor).

RI-2500-5 (6

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Table 16 R-1 STREAM CHANNEL STABILITY FIELD EVALUATION FORM

South Everson

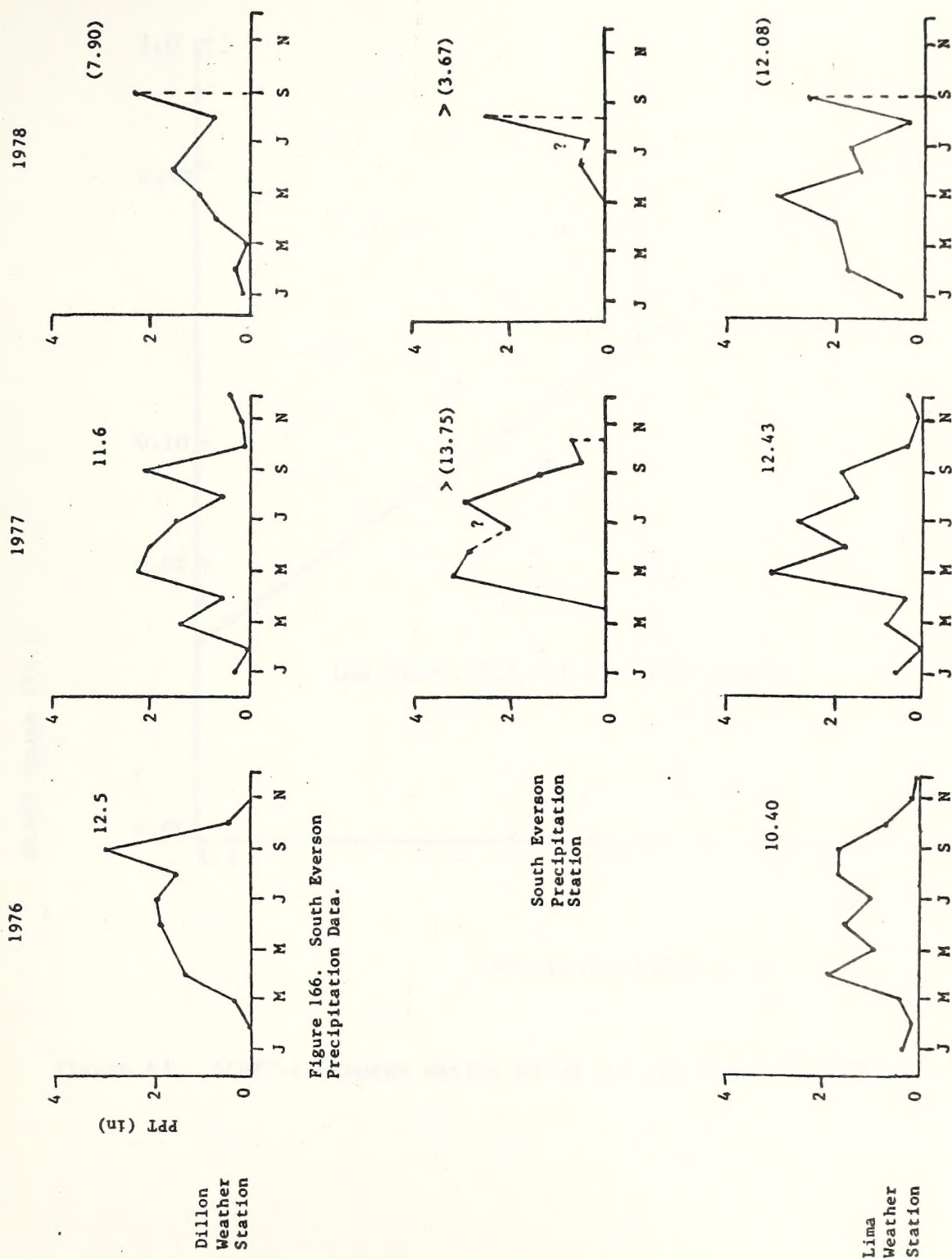
9/3/76

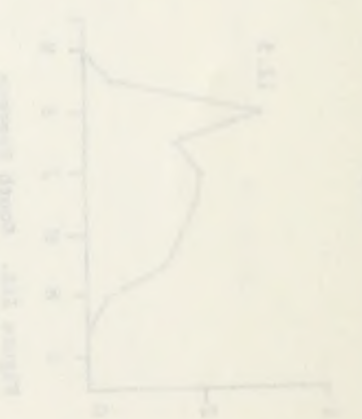
Item Rated		Stability Indicators by Classes			
I. UPPER BANKS		EXCELLENT		GOOD	
Landform Slope		FAIR		POOR	
Mass Wasting (Existing or Potential)	Bank slope gradient <30%. No evidence of past or potential for future mass wasting into channels.	(2) Bank slope gradient 30-40%. Infrequent and/or very small. Mostly healed over. Low future potential.	(3) Bank slope gradient 40-60%. Moderate frequency & size, with some raw spots eroded by water during high flows. Present, volume and size are both increasing.	(6) Bank slope gradient 60% +. Frequent or large, causing sediment nearly yearlong OR imminent danger of same.	8
Debris Jam Potential (Floatable Objects)	Essentially absent from immediate channel area.	(2) Present but mostly small twigs and limbs.	(4) 50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	(6) Moderate to heavy amounts, predominantly larger sizes.	1/2
Bank Protection from Vegetation	90% + plant density. Vigor and variety suggests a deep, dense root mass.	(3) Fewer plant species or lower vigor suggests a less dense or deep root mass.	(6) 70-90% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	(9) Species & less vigor indicate poor, discontinuous, and shallow root mass.	8
II. LOWER BANKS					
Channel Capacity	Ample for present plus some increases. Peak flows contained. W/D ratio <7.	(1) Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8-15.	(2) Barely contains present peaks. Occasional overbank floods. W/D ratio 15-25.	(3) Inadequate. Overbank flow common. W/D ratio >25.	4
Bank Rock Content	65% + with large, angular boulders 12" + numerous.	(2) 40 to 65%, mostly small boulders to cobble 6-12".	(4) 20 to 40%, with most in the 3-6" diameter class.	(6) <20% rock fragments of gravel sizes, 1-3" or less.	8
Obstructions Flow Deflectors Sediment Traps	Rocks, old logs firmly embedded. Flow pattern of pool & riffles stable without cutting or deposition.	(2) Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors never and less firm.	(4) Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	(6) Frequent obstructions and deflectors cause bank erosion yearlong. Sed. traps full, channel migration occurring.	8
Cutting	Little or none evident. Infrequent raw banks less than 6" high generally.	(4) Some, intermittently at outcrops & constrictions. Raw banks may be up to 12".	(6) Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident.	(12) Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16
Deposition	Little or no enlargement of channel or point bars.	(4) Some new increases in bar formation, most from coarse gravels.	(8) Moderate deposition of new gravel & coarse sand on old and some new bars.	(12) Extensive deposits of predominantly fine particles. Accelerated bar development.	16
III. BOTTOM					
Rock Angularity	Sharp edges and corners, plane surfaces roughened.	(1) Rounded corners & edges, surfaces smooth & flat.	(2) Corners & edges well rounded in two dimensions.	(3) Well rounded in all dimensions, surfaces smooth.	4
Brightness	Surfaces dull, darkened, or stained. Gen. not "bright".	(1) Mostly dull but may have up to 35% bright surfaces.	(2) Mixture, 50-50% dull and bright, ± 15%, ie 35-65%.	(3) Predominately bright, 65% +, exposed or scoured surfaces.	4
Consolidation or Particle Packing	Assorted sizes tightly packed and/or overlapping. No change in sizes evident.	(2) Moderately packed with some overlapping.	(4) Mostly a loose assortment with no apparent overlap.	(5) No packing evident. Loose assortment, easily moved.	8
Bottom Size Distribution & Percent Stable Materials	Stable materials 80-100%. Less than 5% of the bottom affected by scouring and deposition.	(4) Distribution shift slight. Stable materials 50-80%. 5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	(8) Moderate change in sizes. Stable materials 20-50%. 30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	(12) Marked distribution change. Stable materials 0-20%. More than 50% of the bottom in a state of flux or change nearly yearlong.	16
Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition.	(6) 5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	(10) 30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	(18) More than 50% of the bottom in a state of flux or change nearly yearlong.	24
Clinging Aquatic Vegetation (Moss & Algae)	Abundant. Growth largely moss like, dark green, perennial. In swift water too.	(1) Common. Algal forms in low velocity & pool areas. Moss here too and swifter waters.	(2) Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	(3) Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4
COLUMN TOTALS		55		19	

Add the values in each column for a total reach score here. (E. - + G. 55 + F. 19 + P. - = 74).

Reach score of: (38-Excellent, 39-76-Good, 77-114-Fair, 115-Poor).

RI-2500-5 (6)





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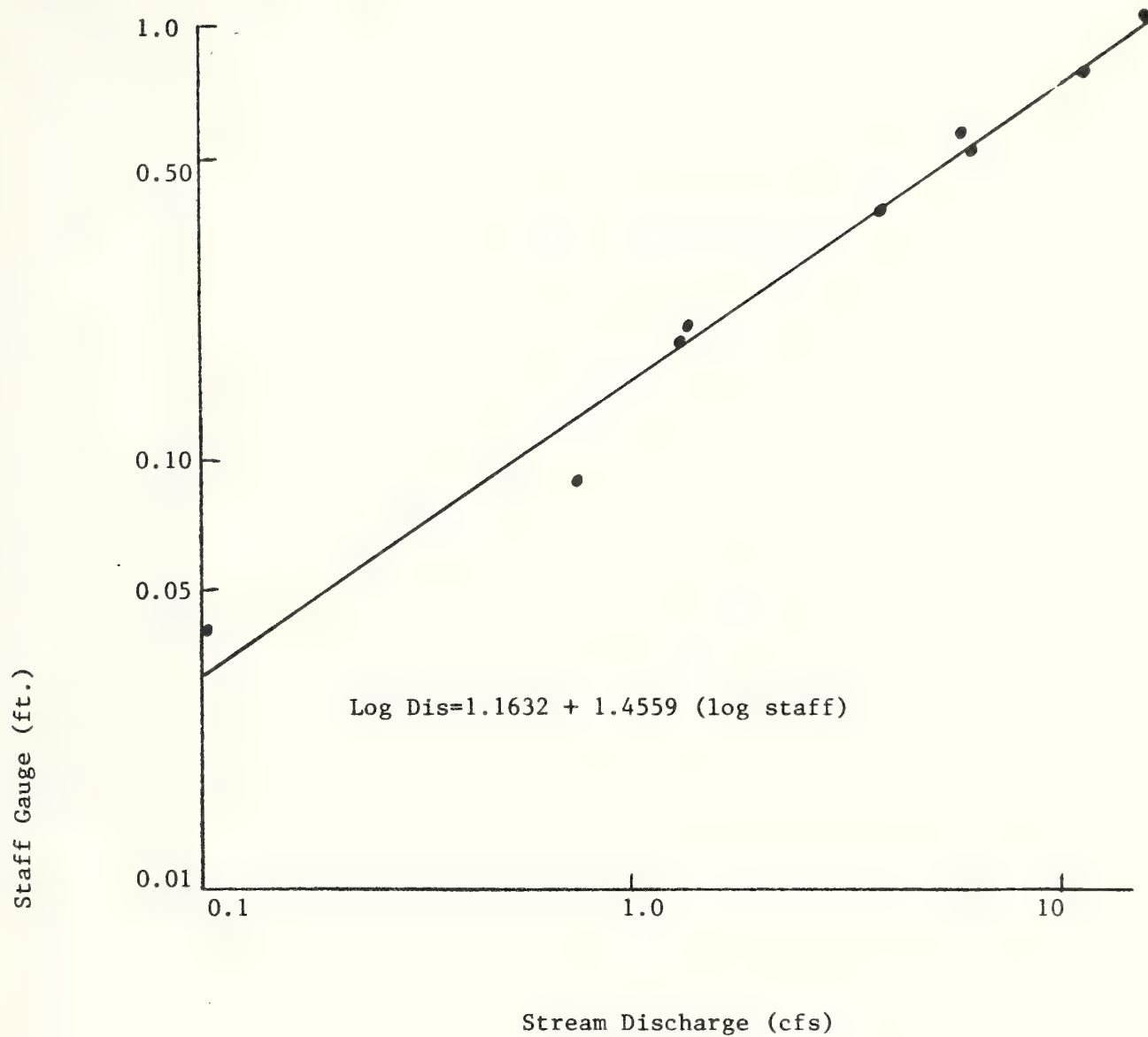


Figure 67. Staff-discharge Rating Curve for the Lower North Everson Station.



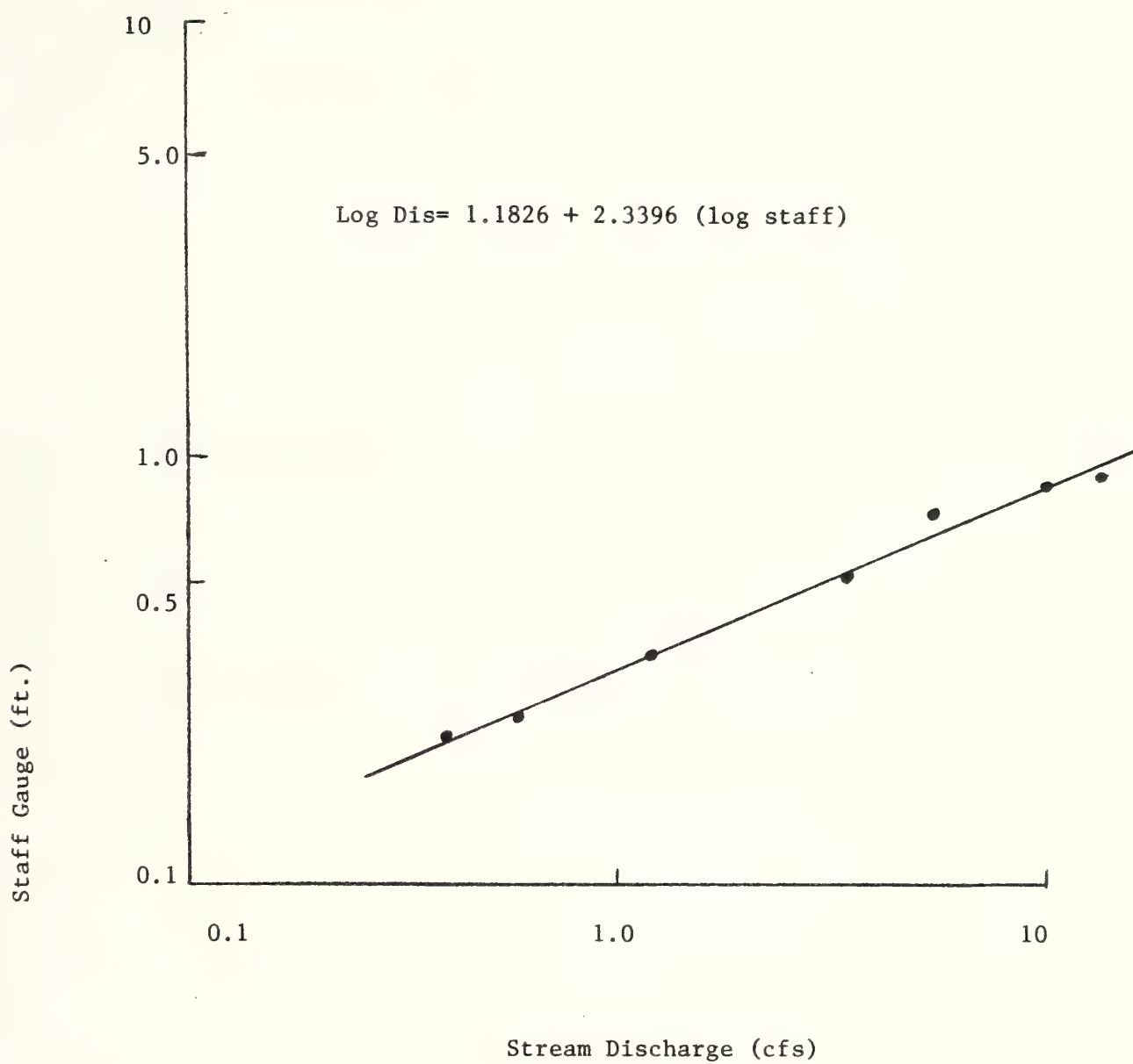


Figure 68. Staff-discharge Rating Curve for the Upper North Everson Station.

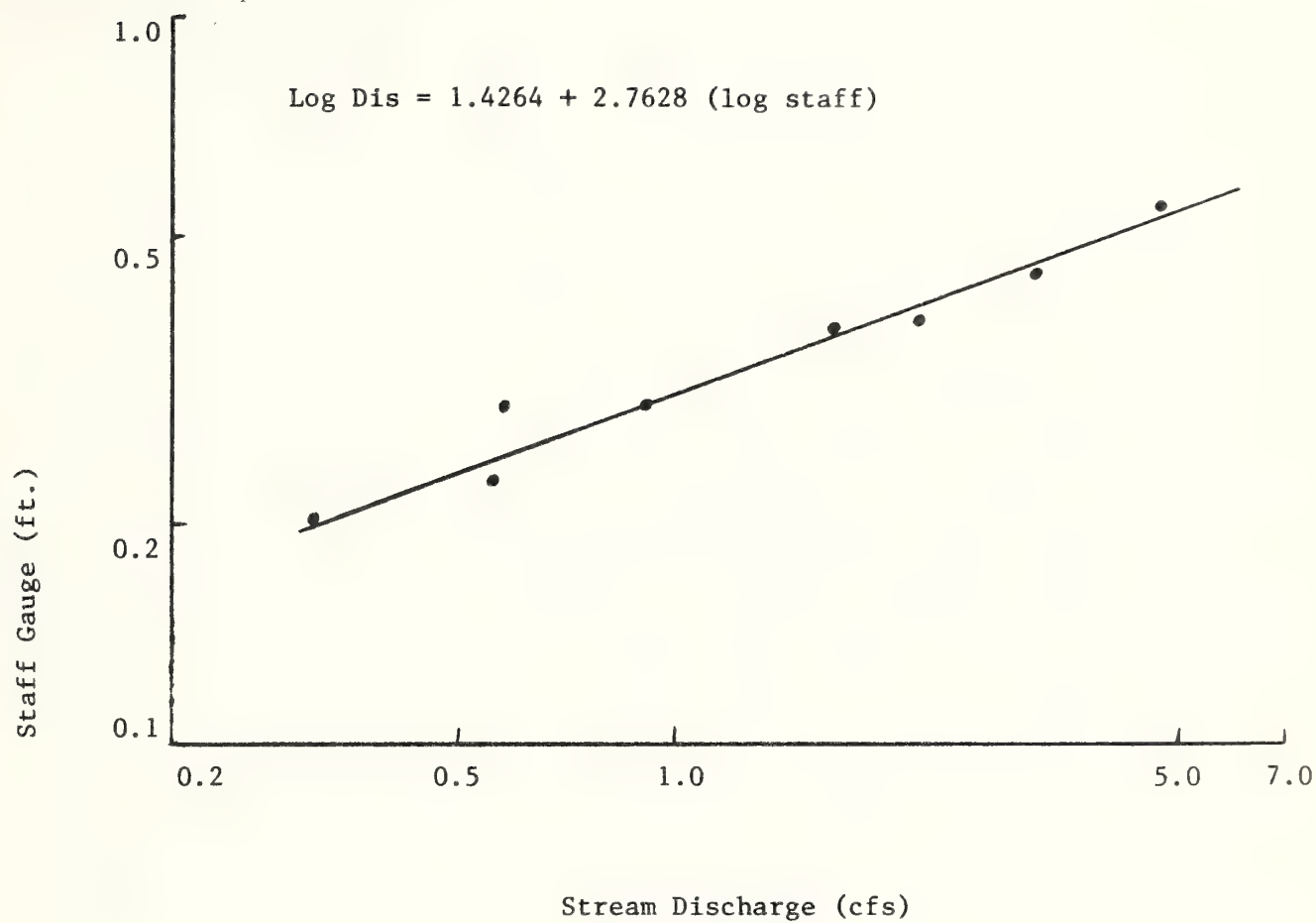
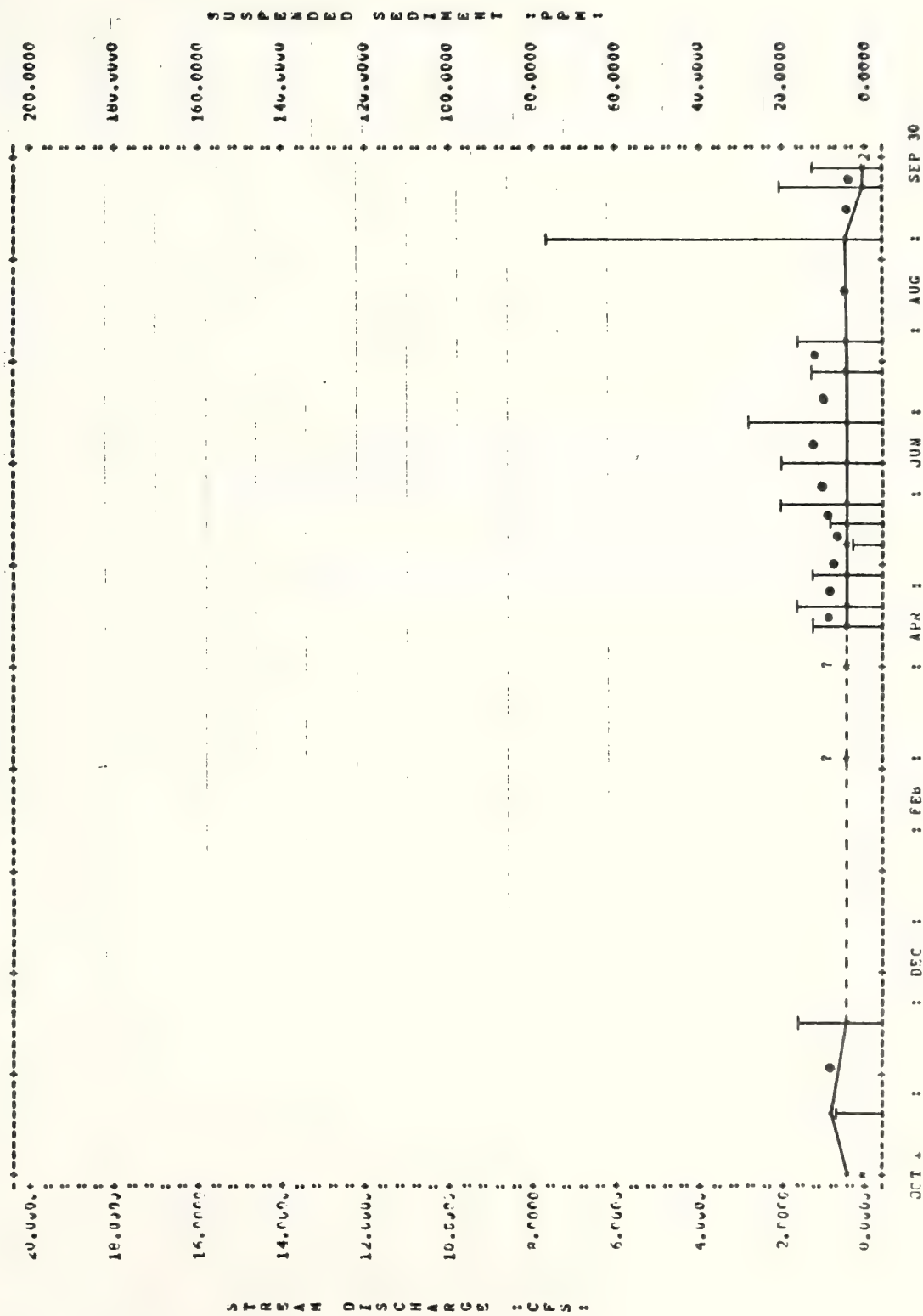


Figure 69. Staff-discharge Rating Curve for the South Everson Station.

stations are presented in Figures 70-75. During the 1977 year, the Lower North Everson flow data indicate a relatively low, constant discharge without any apparent peak period, although an early peak may have occurred in April over channel ice prior to the first sampling visit. Low flow for the year was 0.18 cfs in late September. During 1978, however, a peak flow of 17 cfs was recorded for mid-June. Low flow was 0.19 cfs the previous October. The Upper North Everson station data indicates a similar pattern. A modest peak may have occurred prior to the first sampling visit in 1977, however, the general pattern is of a reduced, relatively constant discharge. Discharge values ranged from 1.5 cfs in mid-June to 0.17 cfs in late September. An estimated 21 cfs crest flow occurred during mid-June, 1978. This value may, however, be somewhat overestimated. The lowest recorded flow was again 0.17 cfs the preceeding October. A modest peak flow of 1.2 cfs occurred at the South Everson station early May, 1977, while the annual low flow of 0.20 cfs was recorded in mid-September. During 1978, however, the mid-June period produced an estimated peak flow of 7.4 cfs, while the low flow for the year was 0.26 cfs the previous October. The differences noted in flow patterns for the two hydrologic years are largely attributed to differences in the annual and seasonal precipitation patterns and the snow-melt rates.

The respective annual hydrograph data were used to estimate the annual water yields for each station (Table 17). During the less active 1977 hydrologic year, the data indicate a yield of 320 acre feet for Lower North Everson, 375 acre feet for Upper North Everson, and 215 acre feet for South Everson. These values increased to 1040 acre feet, 880 acre feet, and 490 acre feet respectively during the more active 1978 hydrologic year.

FIGURE 70. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER M EVERSON - 1977



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109. 1417 191

FIGURE 71. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER N EVERSON - 1978

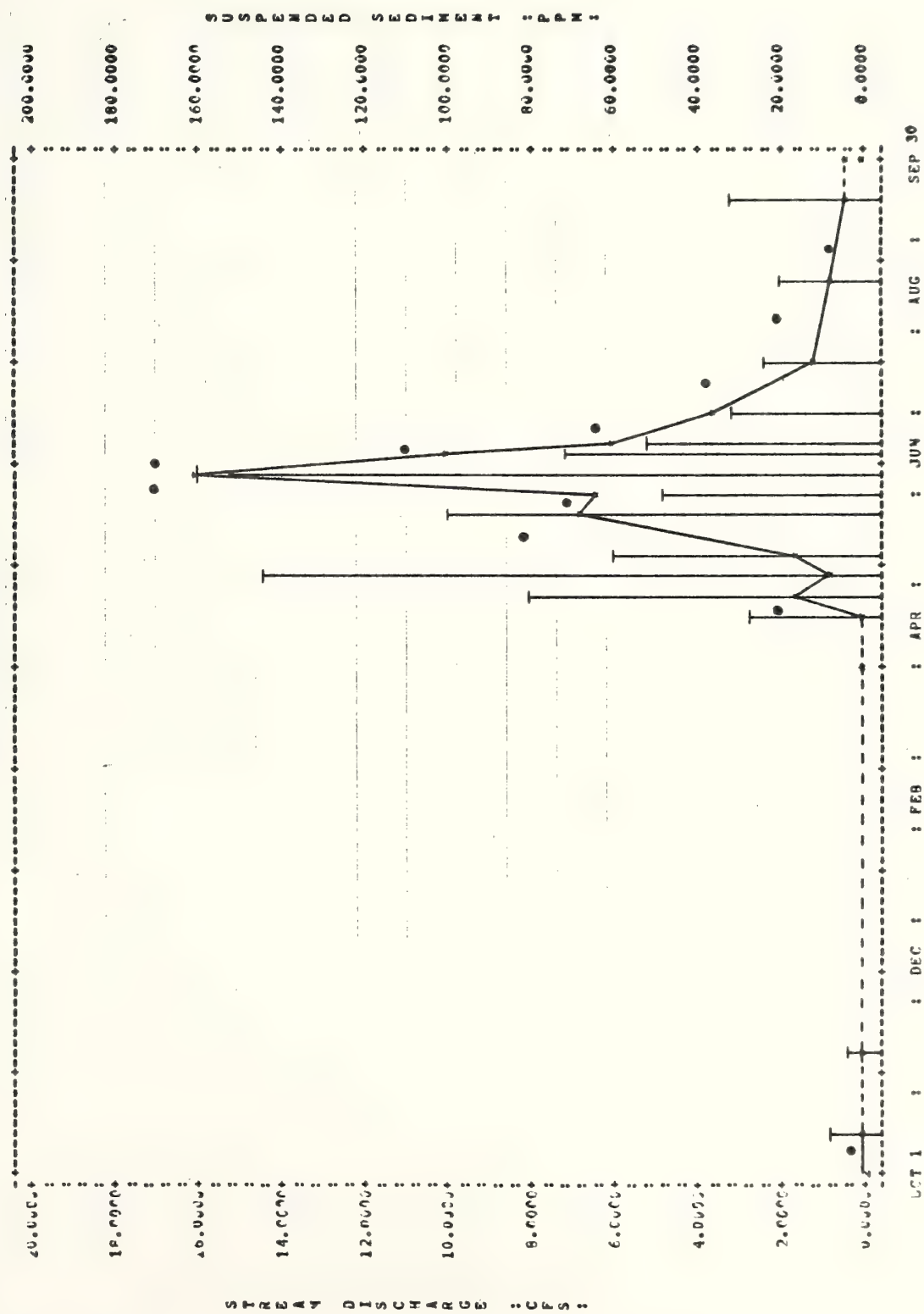


FIGURE 72. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER N EVERSON - 1977

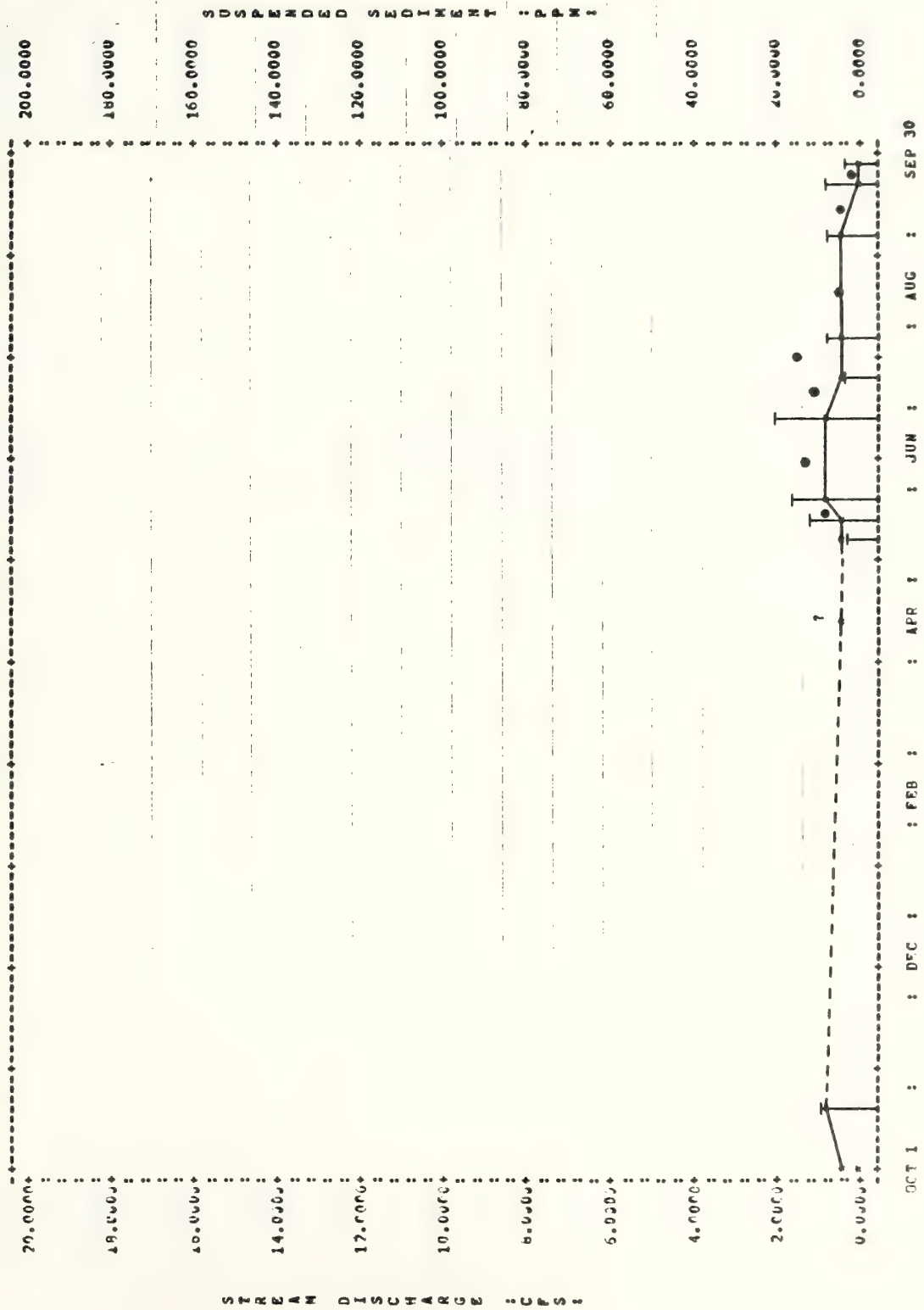


FIGURE 73. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER N EVERSON - 1978

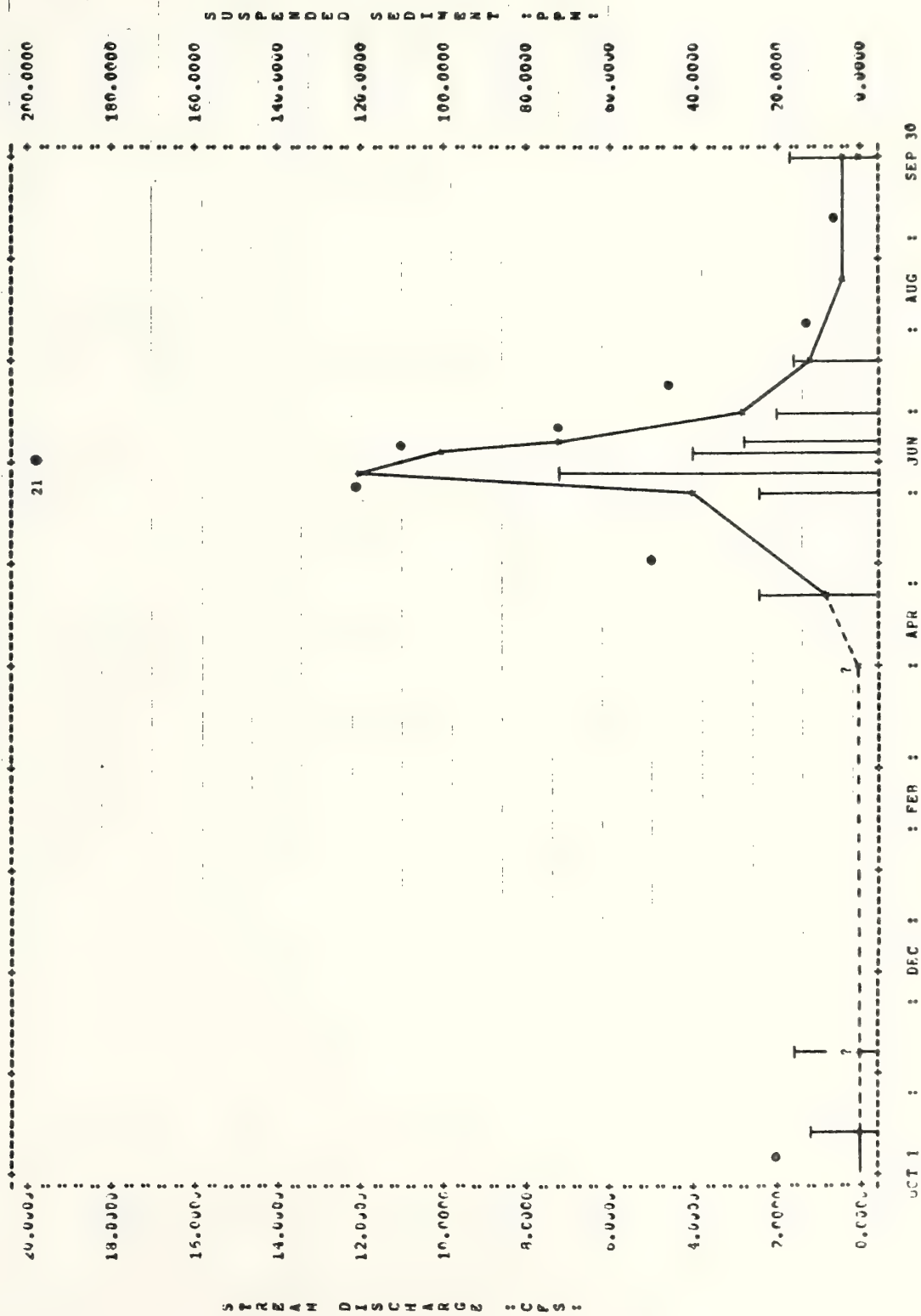


FIGURE 74. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS

S EVERSON - 1977

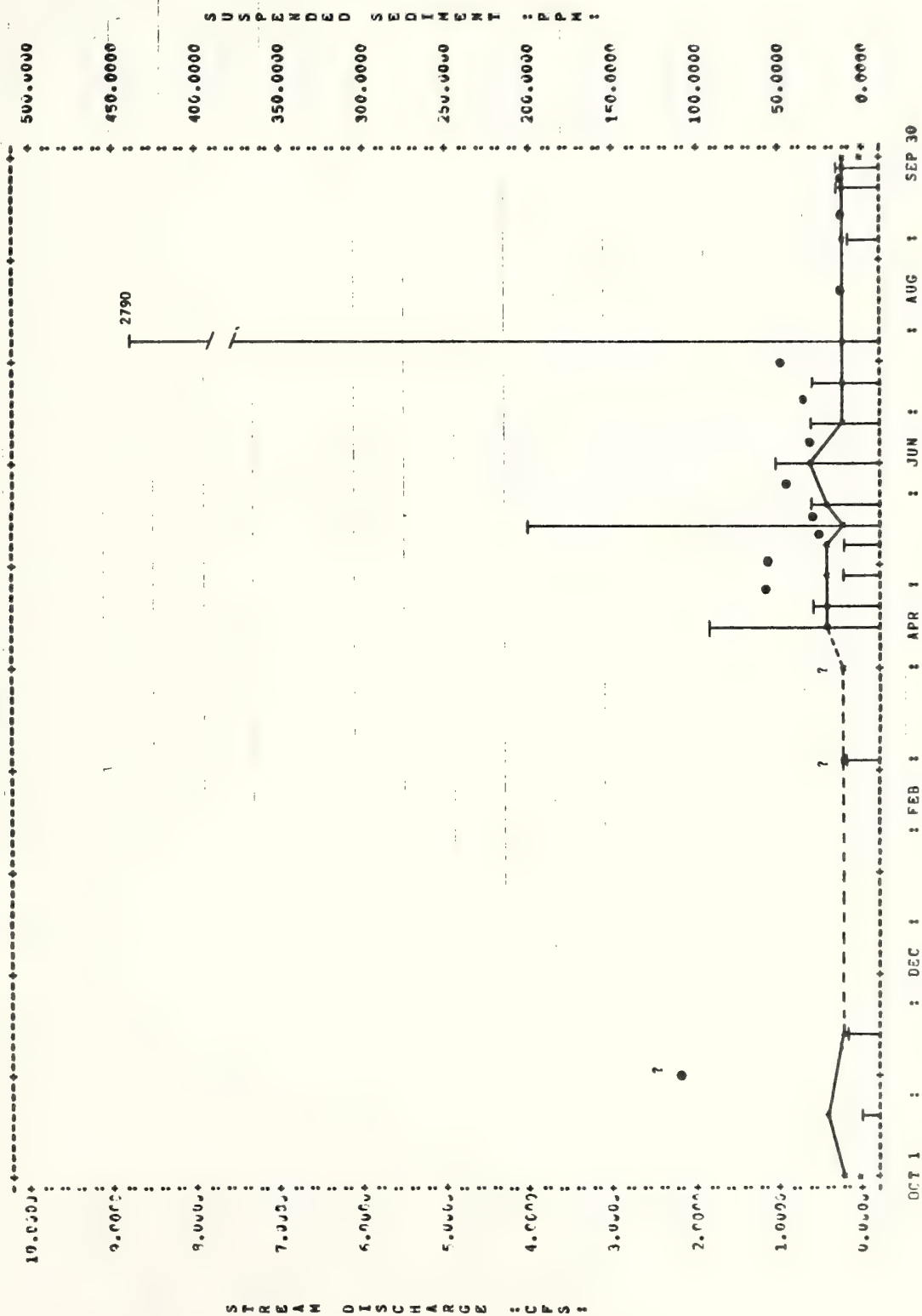


FIGURE 75. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS

S EVERSON - 1978

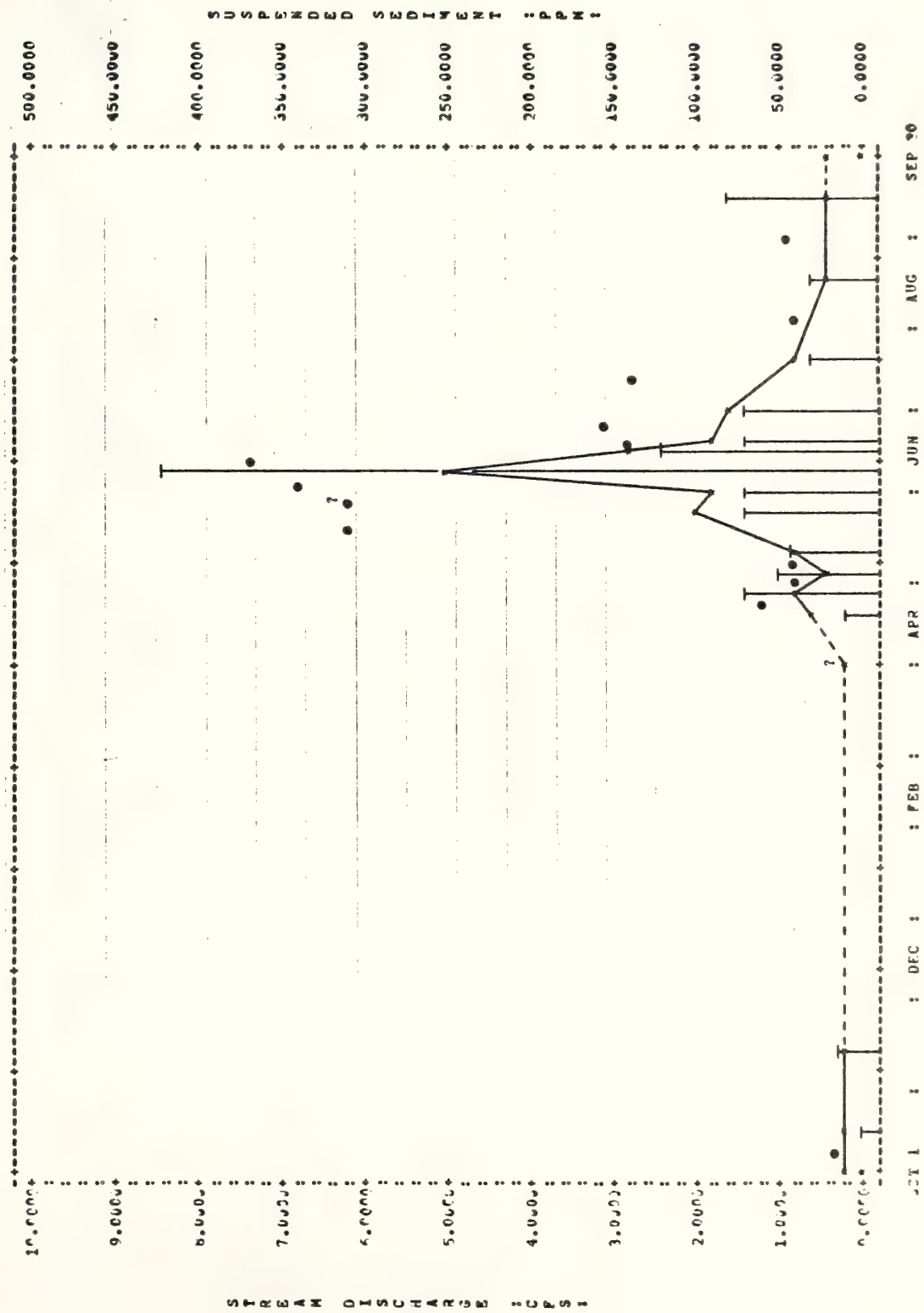


Table 17. Estimated Annual Water and Sediment Yields for Everson Creek, 1977 - 1978.

Station Name	Water Year	Estimated Water Yield (ac. - ft.)	Estimated Sediment Yield (tons)	Contributing Watershed (acres)	Runoff (in./ac.)	Sediment Yield (lbs/acre)
Lower North Everson Station	1977	320	7.6	2,430	1.58	6.25
	1978	1,040	109	2,430	5.14	89.7
Upper North Everson Station	1977	375	4.8	1,250	3.60	7.74
	1978	880	40	1,250	8.45	64.5
South Everson Station	1977	215	6.9	2,050	1.26	6.75
	1978	490	70	2,050	2.87	67.5

Suspended Sediment

The annual pattern of sediment concentration for each station by hydrologic year is depicted in Figures 70-75. Suspended sediment concentrations at the Lower North Everson station ranged from < 5 ppm at low flow to 160 ppm at high flow, the Upper North Everson station from < 5 ppm to 73 ppm, while the South Everson values extended from < 5 ppm to 2790 ppm. Higher suspended sediment values were generally recorded during the 1978 hydrologic year when there were higher discharge values. The relationships between suspended sediment and stream discharge for each station were statistically significant, and are presented in Figures 76-78. The variability in sediment concentration with stream flow is partially attributed to a seasonal effect, specific storm effects, the presence of livestock and to the hysteresis effect, whereby peak concentrations of suspended sediment generally occur prior to peak runoff during the rising stage (Gregory and Walling, 1973, pp. 215-219). Annual sediment yields for the two sample stations were estimated from respective water yield and sediment concentration data (Table 17). The Lower and Upper North Everson stations recorded approximately 7.6 tons and 4.8 tons of suspended sediment respectively during 1977. The South Everson yield was estimated at 6.9 tons. These yields were increased to 109 tons, 40 tons, and 69.5 tons for the more active 1978 hydrologic year.

Hydrochemical Parameters

The concentration of dissolved solids is inversely related to stream discharge so that lower concentrations occur during periods of high runoff, while higher concentrations are found during periods of low summer base flow (Gunnerson, 1967; Gregory and Walling, 1973, pp. 219-225). Patterns for specific ions, especially the ecologically important ones, often vary from this generalization (Likens, et al., 1977, pp. 74-76).

FIGURE 76. SUSPENDED SEDIMENT VS STREAM DISCHARGE - LOWER NORTH EVERSON

LOG SED = 1.4686 + 0.4494(LOG DIS)

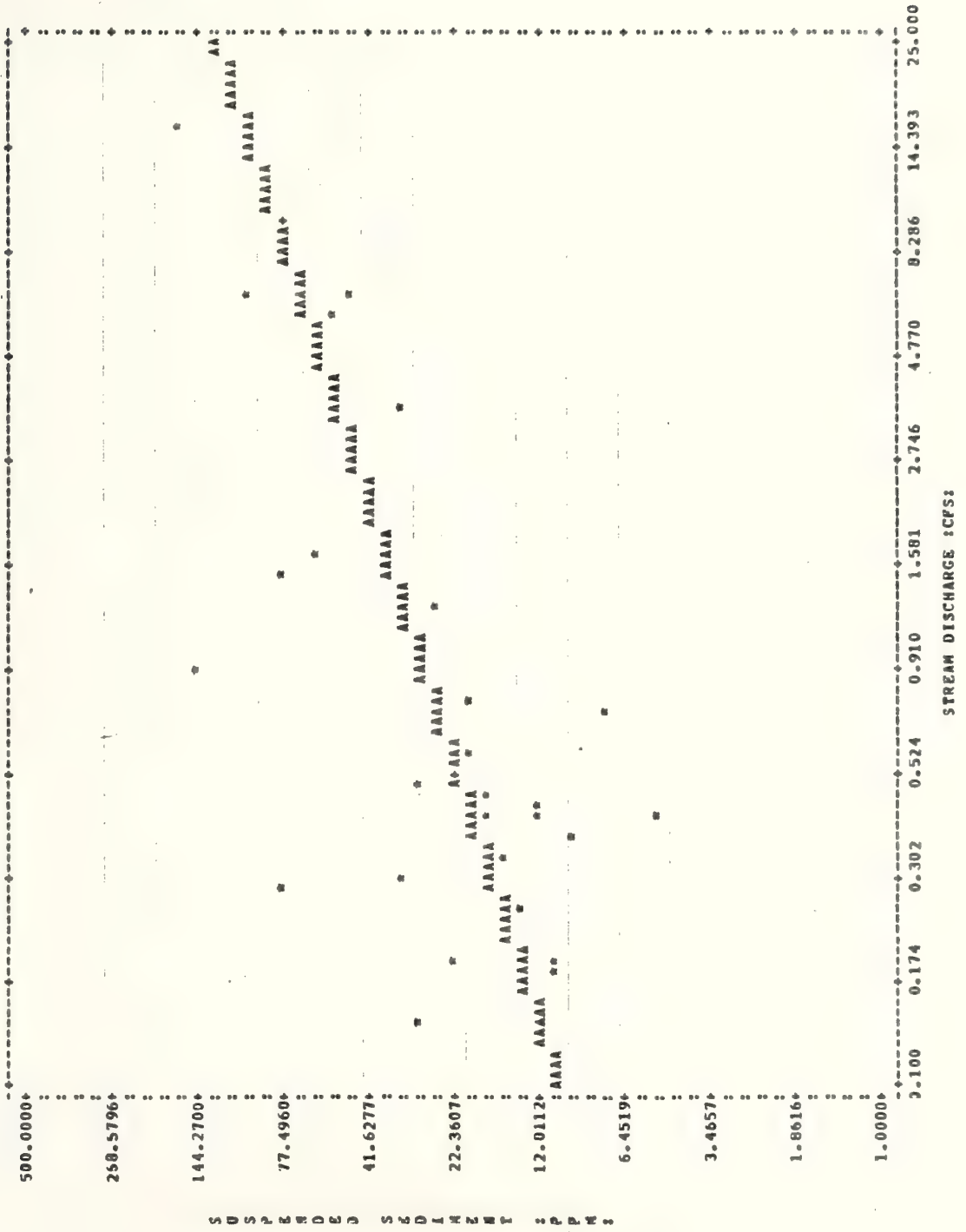


FIGURE 77. SUSPENDED SEDIMENT VS STREAM DISCHARGE - UPPER NORTH EVERSON

LOG SED = 1.1869 + 0.4175(LOG DIS)

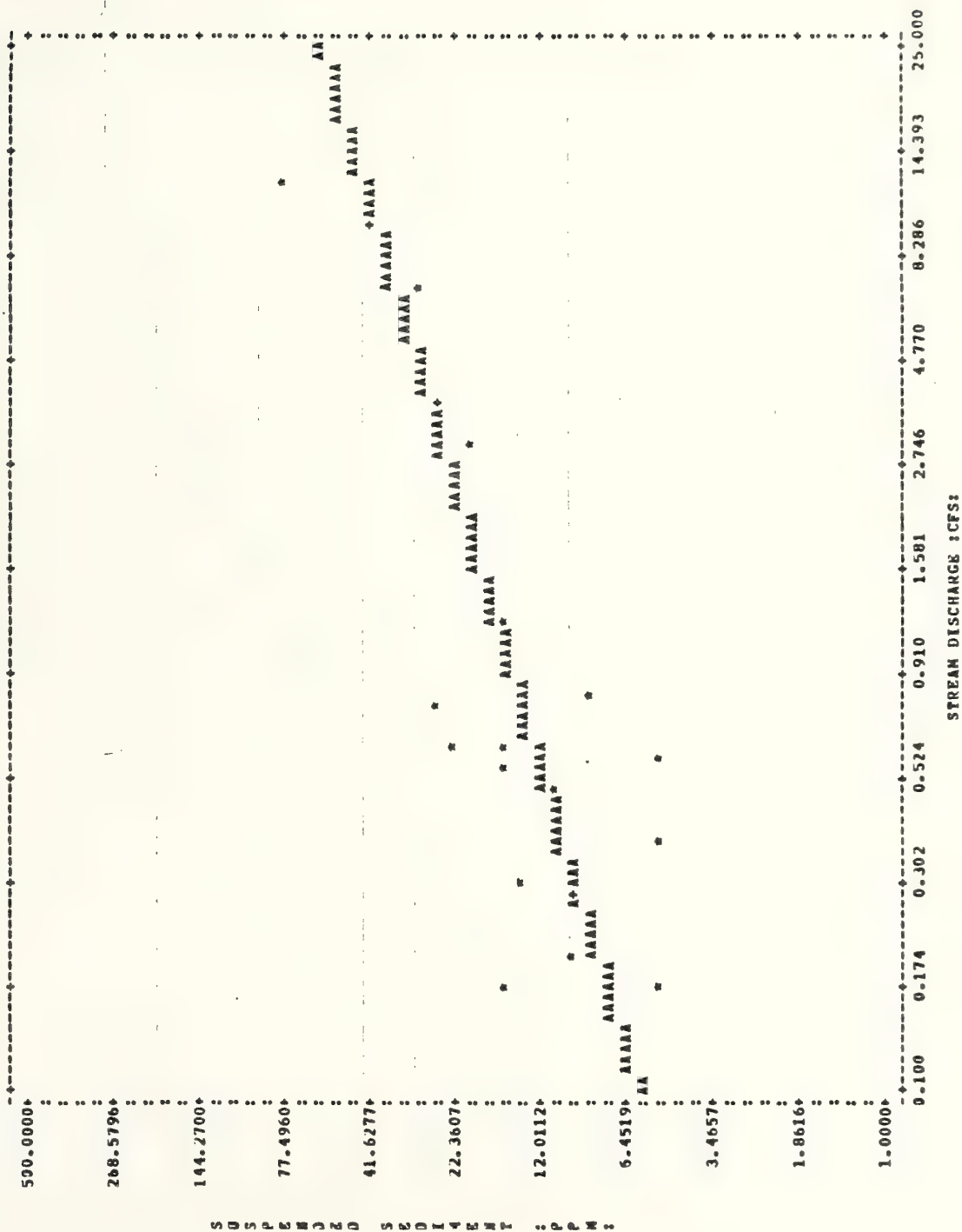
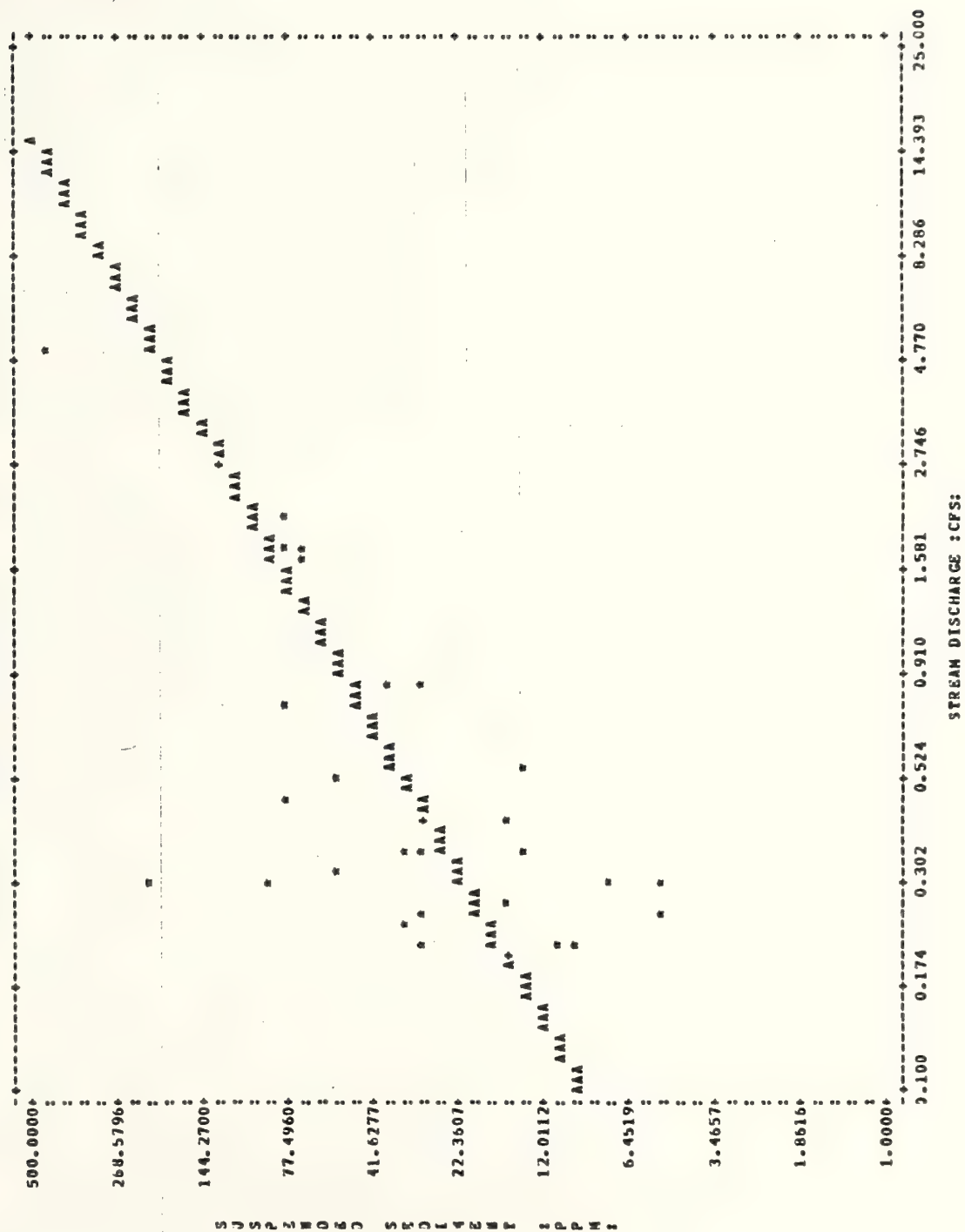


FIGURE 78. SUSPENDED SEDIMENT VS STREAM DISCHARGE - SOUTH EVERSON

$$\text{LOG SED} = 1.7434 + 0.794(\text{LOG DIS})$$



Specific conductance for the Lower North Everson station ranged from a low of 62 μ mhos during high spring runoff to a high of 267 μ mhos during late summer base flow, while the upper station had a reduced range of 58 μ mhos to 142 μ mhos. The South Everson station generated higher values that ranged from 108 μ mhos to 378 μ mhos. The relationships between specific conductance and stream discharge for the Everson stations were statistically significant and are presented in Figures 79-81. Variation in specific conductance with stream discharge is partially attributed to seasonal and storm hysteresis effects (Gregory and Walling, 1973, pp. 219-225). The ranges in ionic concentration for specific ions are presented in Table 18.

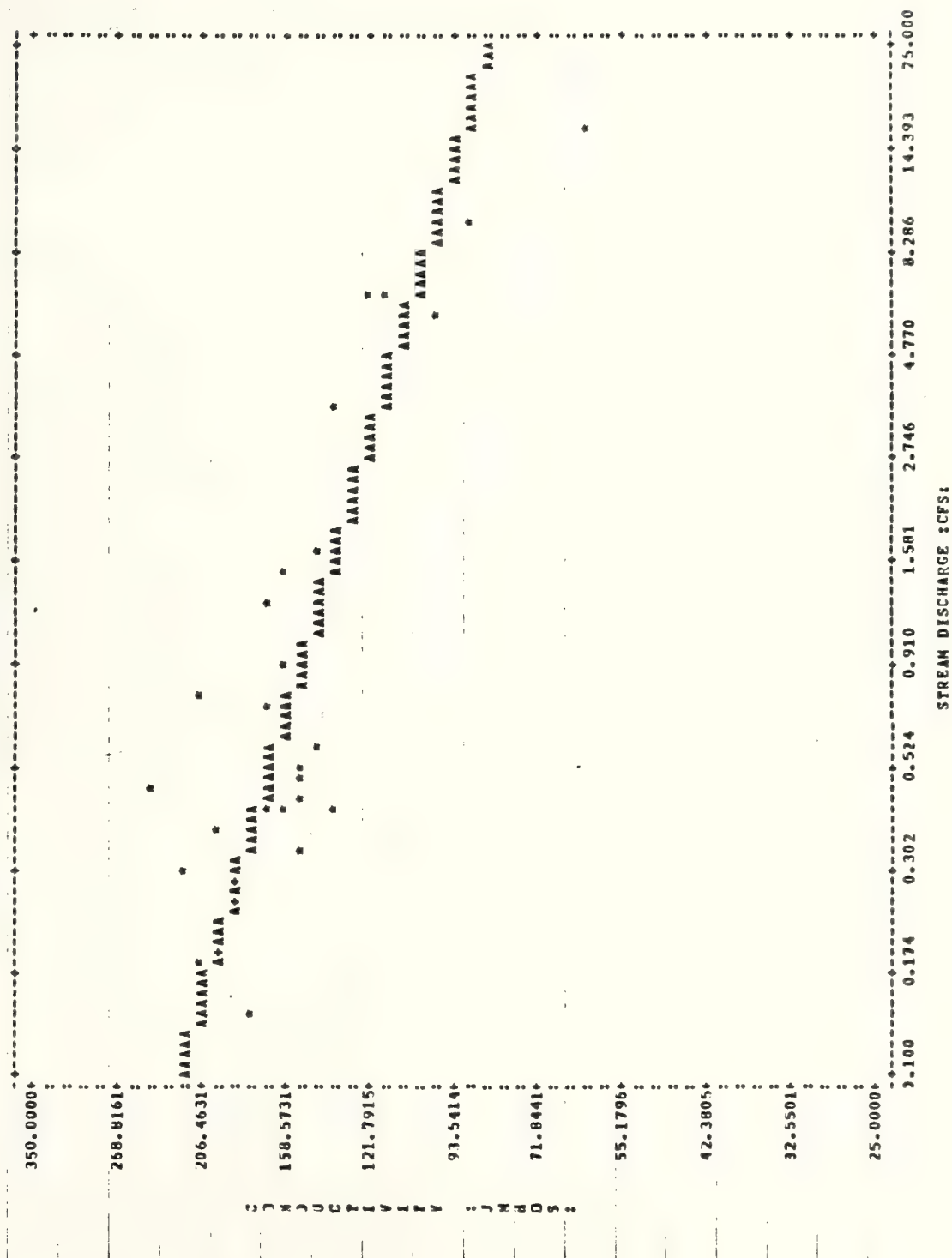
Bacteria Levels

The concentration of fecal and total coliform in streams draining rangeland watersheds is directly related to the number of cattle present, their access to the stream, the physical and hydrological characteristics of the basin, local weather conditions (Kunkle, 1970; Stephensen and Street, 1978), and the time of day (Kunkle and Meiman, 1968). Seasonal patterns include a spring "flushing" effect during the rising stage (Kunkle and Meiman, 1968), with high counts during the low flow summer period, counts which often continue for some period after the cattle have been removed from the area (Stephensen and Street, 1978). This seasonal pattern may briefly be modified by local storms which produce their own "flushing" effect, and which may or may not be followed by a short term dilution period.

The concentrations of fecal coliform for the Everson Creek sampling stations for the study period are presented in Table 19. Higher values occurred during the grazing season, especially with the known presence of livestock in the basin. Maximum fecal coliform levels were TNTC, 143, and 7200 colonies/100 mls respectively for each station. Approximately 58 percent

FIGURE 79. CONDUCTIVITY VS STREAM DISCHARGE - LOWER NORTH EVERSON

LOG COND = 2.1712 - 0.176(LOG DIS)



STREAM DISCHARGE (CFS)

FIGURE 80. CONDUCTIVITY VS STREAM DISCHARGE - UPPER NORTH FVYERSON

LOG COND = 1.9951 - 0.1577(LOG DIS)

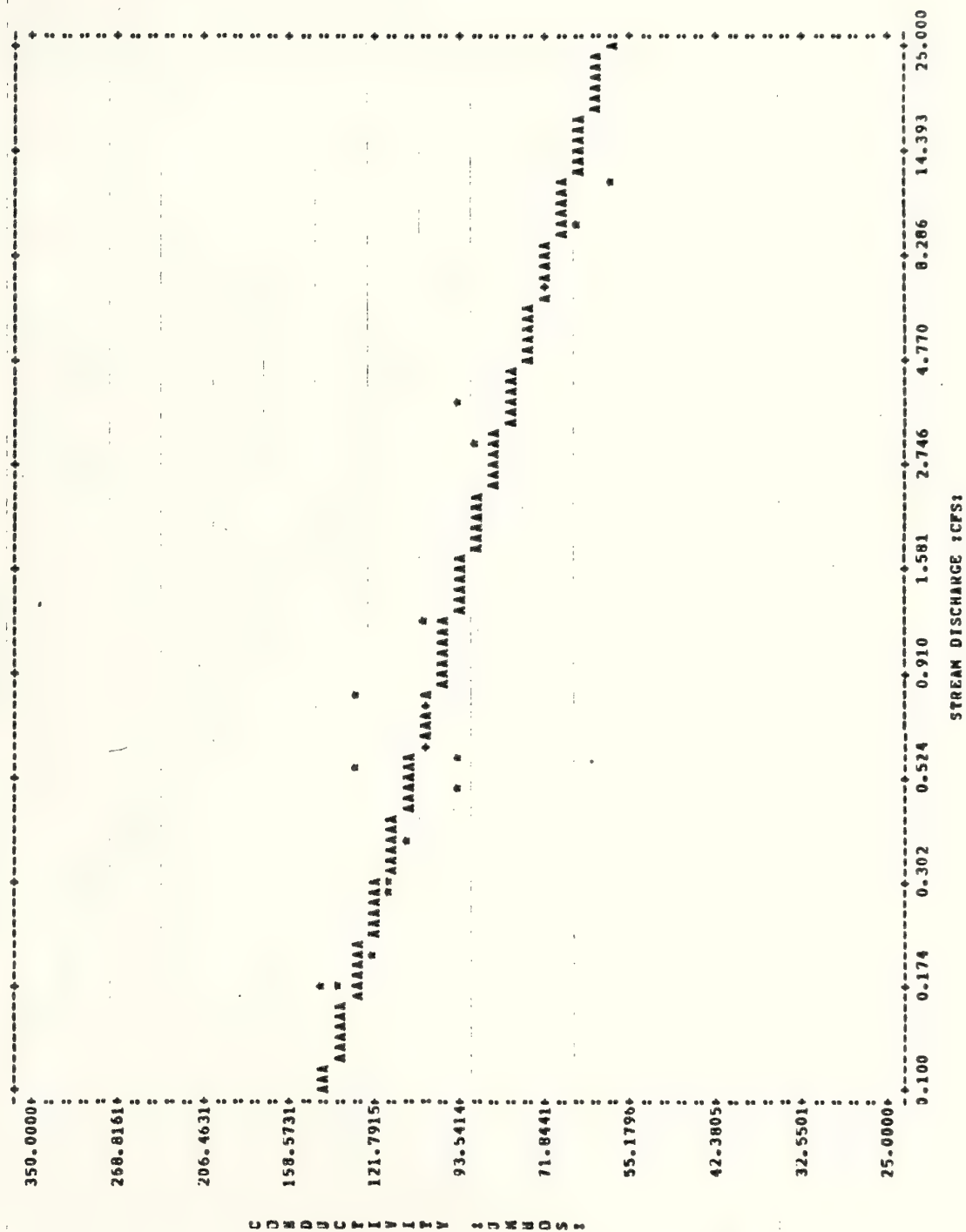


FIGURE 81. CONDUCTIVITY VS STREAM DISCHARGE - SOUTH EVERSON

LOG COND = 2.2661 - 0.3298(LOG DIS)

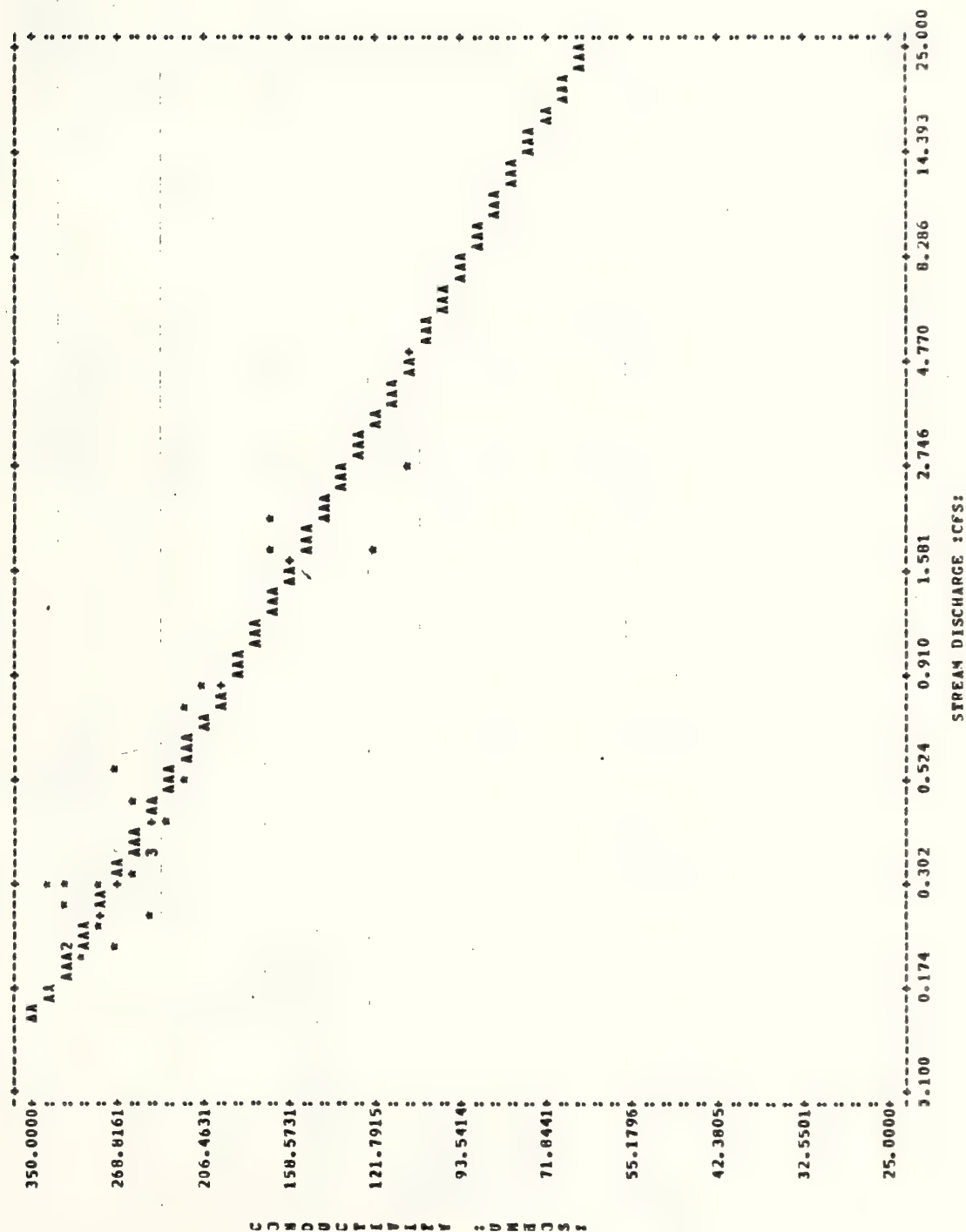


Table 18. Ranges in the Hydrochemical Parameters of the Everson Creek Watershed Sampling Stations, 1977 - 1978.

	Lower		Upper		South
	North	Everson	North	Everson	Everson
pH	7.20	- 7.98	6.70	- 7.89	7.41 - 8.20
Alkalinity (CaCO ₃) (mg/l)	52	- 106	33	- 66	61 - 149
Specific Conductance (μmhos)	62	- 267	58	- 142	108 - 378
Total Dissolved Solids (mg/l)	40	- 174	38	- 92	70 - 246
Ca (mg/l)	14	- 35	10	- 18	14 - 43
Mg (mg/l)	5.4	- 12	4.3	- 7.6	7.6 - 20
Na (mg/l)	3.4	- 7.4	2.1	- 4.1	4.7 - 9.3
K (mg/l)	1.2	- 3.2	0.92	- 1.8	1.4 - 2.9
HCO ₃ (mg/l)	63	- 129	46	- 81	73 - 182
SO ₄ (mg/l)	2	- 9	1	- 3	5 - 25
NH ₄ (mg/l)	< 0.01	- 0.22	< 0.01	- 0.18	< 0.01 - 0.04
NO ₃ + NO ₂ - N (mg/l)	< 0.01	- 0.40	< 0.01	- 0.31	0.03 - 0.31
PO ₄ ²⁻ (Ortho) -P (mg/l)	0.004	- 0.092	0.012	- 0.042	0.025 - 0.094

Table 19. Fecal Coliform Counts (colonies/100 mls) for the Everson Creek Watershed Sampling Station, 1977 - 1978.

	Lower North Everson		Upper North Everson		South Everson	
	1977	1978	1977	1978	1977	1978
April		--		--		--
May	80	21	< 2	n.s.	800	29
June	650(?)	12	50*	<1	3730(?)	14
July	700(?)	550	120(?)	78*	3380*	447*
August	TNTC*	283	74(?)	73*	7200(?)	453
September	420(?)	347	8	143*	250*	6150*
October	92		27		50(?)	
November	167		6		35	

* Stock visually present.

(?) Stock presence uncertain.

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1881
1882

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1891

and 67 percent of the sample coliform counts for Lower North Everson and South Everson exceeded the 200 colony/100 ml limit of the Montana Water Quality Criteria. The Upper North Everson station had no exceptions.

Comments

The two sampling years produced two dramatically different annual hydrographes owing to very different precipitation patterns. Heavy live-stock concentrations along the stream courses, especially in South Everson, directly influenced such water quality parameters as sediment concentration and fecal coliform levels. There is strong evidence of livestock trampling in the wet meadow surrounding the Upper North Everson station. Because of the limited number of samples taken and the nature of the hydrochemical parameters evaluated, relationships between the water quality characteristics of Everson Creek and the Montana Water Quality Criteria cannot be addressed.

Black Canyon Creek Basin

The Black Canyon Creek sample basin was visited a total of 16 and 16 times during the two hydrologic years. Impassable road conditions and inclement weather made the upper station inaccessible on several occasions. Residual channel ice created some sampling problems during the early spring of 1977. The Upper Black Canyon station was monitored 13 and 12 times respectively.

Channel Stability Ratings

Black Canyon Creek from above the Beaverhead National Forest boundary to the Lower station was evaluated on September 1, 1976. This portion of the creek was rated as 'fair' (86) (Table 20). A large beaver pond has been created approximately one-half mile above the Lower station since the inventory.

USDA-FOREST SERVICE

Table 20 R-1 STREAM CHANNEL STABILITY FIELD EVALUATION FORM

Black Canyon

9/1/76

Item Rated	Stability Indicators by Classes				POOR
	EXCELLENT	GOOD	FAIR	POOR	
I. UPPER BANKS					
Landform Slope	Bank slope gradient <30%	Bank slope gradient 30-40%	Bank slope gradient 40-60%	Bank slope gradient 60% +	8
Mass Wasting (Existing or Potential)	No evidence of past or potential for future mass wasting into channels.	Infrequent and/or very small future potential.	Moderate frequency & size, with some raw spots eroded by water during high flows.	Frequent or large, causing sediment nearly yearlong OR imminent danger of same.	12
Debris Jam Potential (Floatable Objects)	Essentially absent from immediate channel area.	Present but mostly small twigs and limbs.	Present, volume and size are both increasing.	Predominantly larger sizes, <50% density plus fewer species & less vigor indicate poor, discontinuous, and shallow root mass.	8
Bank Protection from Vegetation	90% + plant density. Vigor and variety suggests a deep, dense root mass.	70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass.	50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	<50% density plus fewer species & less vigor indicate poor, discontinuous, and shallow root mass.	12
II. LOWER BANKS					
Channel Capacity	Ample for present plus some increases. Peak flows contained. W/D ratio <7.	Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8-15.	Barely contains present floods. Occasional overbank floods. W/D ratio 15-25.	Inadequate. Overbank flows common. W/D ratio >25.	4
Bank Rock Content	65% + with large, angular boulders 12" + numerous.	40 to 65%, mostly small boulders to cobble 6-12".	20 to 40%, with most in the 3-6" diameter class.	<20% rock fragments of gravel sizes, 1-3" or less.	8
Obstructions Flow Deflectors Sediment Traps	Rocks, old logs firmly embedded. Flow pattern of pool & riffles stable without cutting or deposition.	Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm.	Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	Frequent obstructions and deflectors cause bank erosion yearlong. Sed. traps full, channel migration occurring.	8
Cutting	Little or none evident. Infrequent raw banks less than 6" high generally.	Some, intermittently at outcrops & constrictions. Raw banks may be up to 12".	Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident.	Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16
Deposition	Little or no enlargement of channel or point bars.	Some new increases in bar formation, most from coarse gravels.	Moderate deposition of new gravel & coarse sand on old and some new bars.	Extensive deposits of predominantly fine particles. Accelerated bar development.	16
III. BOTTOM					
Rock Angularity	Sharp edges and corners. Plane surfaces roughened.	Rounded corners & edges. Surfaces smooth & flat.	Corners & edges well rounded in two dimensions.	Well rounded in all dimensions, surfaces smooth.	4
Brightness	Surfaces dull, darkened, or stained. Gen. not "bright".	Mostly dull but may have up to 35% bright surfaces.	Mixture, 50-50% dull and bright, ± 15% ie 35-65%.	Predominately bright, 65% + exposed or scoured surfaces.	4
Consolidation or Particle Packing	Assorted sizes tightly packed and/or overlapping.	Moderately packed with some overlapping.	Mostly a loose assortment with no apparent overlap.	No packing evident. Loose assortment, easily moved.	8
Bottom Size Distribution	No change in sizes evident.	Distribution shift slight.	Moderate change in sizes.	Marked distribution change.	16
Percent Stable Materials	Stable materials 80-100%.	Stable materials 50-80%.	Stable materials 20-50%.	Stable materials 0-20%.	16
Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition.	3-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	30-50% affected. Deposits & scour at obstructions, constrictions, and bends.	More than 50% of the bottom in a state of flux or change nearly yearlong.	24
Clinging Aquatic Vegetation (Moss & Algae)	Abundant. Growth largely moss like, dark green, perennial. In swift water too.	Common. Algal forms in low velocity & pool areas. Moss here too and under waters.	Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4
COLUMN TOTALS	5	12	67	8	

Add the values in each column for a total reach score here. (2.5 + 0.12 + 7.61 + 1.8 = 8.6).

Reach score of: <30=Excellent, 39-76=Good, 77-114=Fair, 115=Poor.

RI-2500-5 (6)

Stream Discharge

The staff-discharge rating curves for the Lower Black Canyon and Upper Black Canyon sampling stations are presented in Figures 82 and 83. The Lower station channel reach experienced relatively minor modification during the two sampling years. The Upper station, however, was radically altered during the peak flow of June, 1978.

The 1977 and 1978 annual hydrographs for the Lower Black Canyon and Upper Black Canyon Creek sampling stations are presented in Figures 84-87. Peak flow at the Lower Black Canyon station may have occurred over channel ice in early April prior to the initial sampling. The peak recorded flow was 8.2 cfs in late July and resulted from an unusually active storm period. Low flow for the year was 0.85 cfs under channel ice in mid-April. During 1978, however, an early peak flow of 22 cfs in mid-May preceeded the seasonal peak discharge of approximately 57 cfs in mid-June. The lowest recorded flow for 1978 was 1.1 cfs the previous November. At the Upper Black Canyon station, an estimated peak discharge of 11 cfs was noted in early June, 1977. The lowest recorded flow for the year was 1.4 cfs in mid-September. During 1978, however, an annual peak discharge of 45 cfs was measured in mid-June, while the lowest flow was recorded at 1.1 cfs in the previous October. The differences noted in flow patterns for the two hydrologic years are largely attributed to differences in the annual precipitation and snow melt patterns.

The respective annual hydrograph data were used to estimate the annual water yields for each station (Table 21). In both water years, the estimated yield for the Upper Black Canyon was approximately 85 percent of that of the Lower Black Canyon station. These values were 1890 acre feet and 3810 acre feet for the Lower station and 1590 acre feet and 3330 acre feet for the Upper station. Over a two-fold increase in water yield was noted for 1978 at each station.

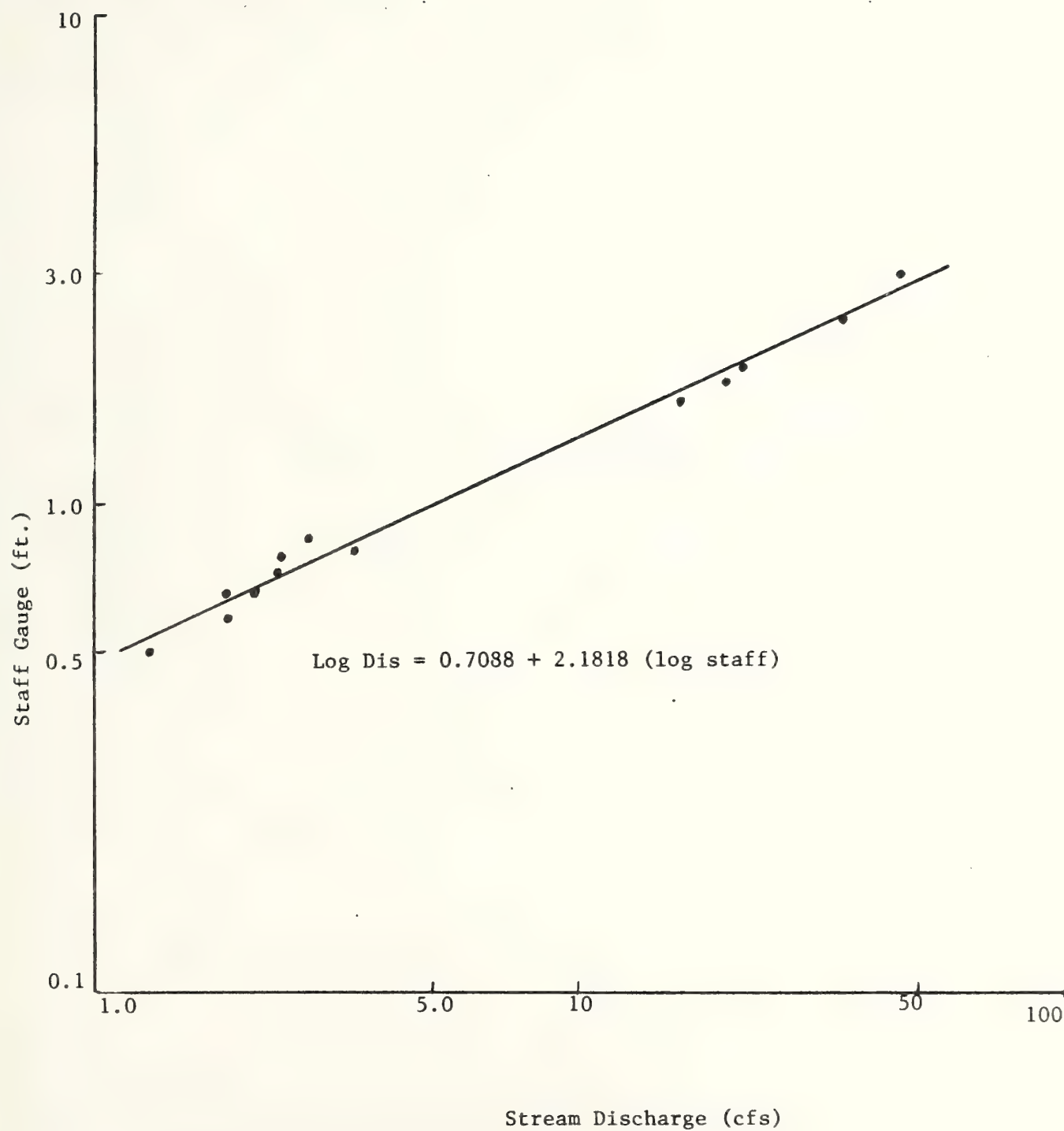


Figure 82. Staff-discharge Rating Curve for the Lower Black Canyon Station.

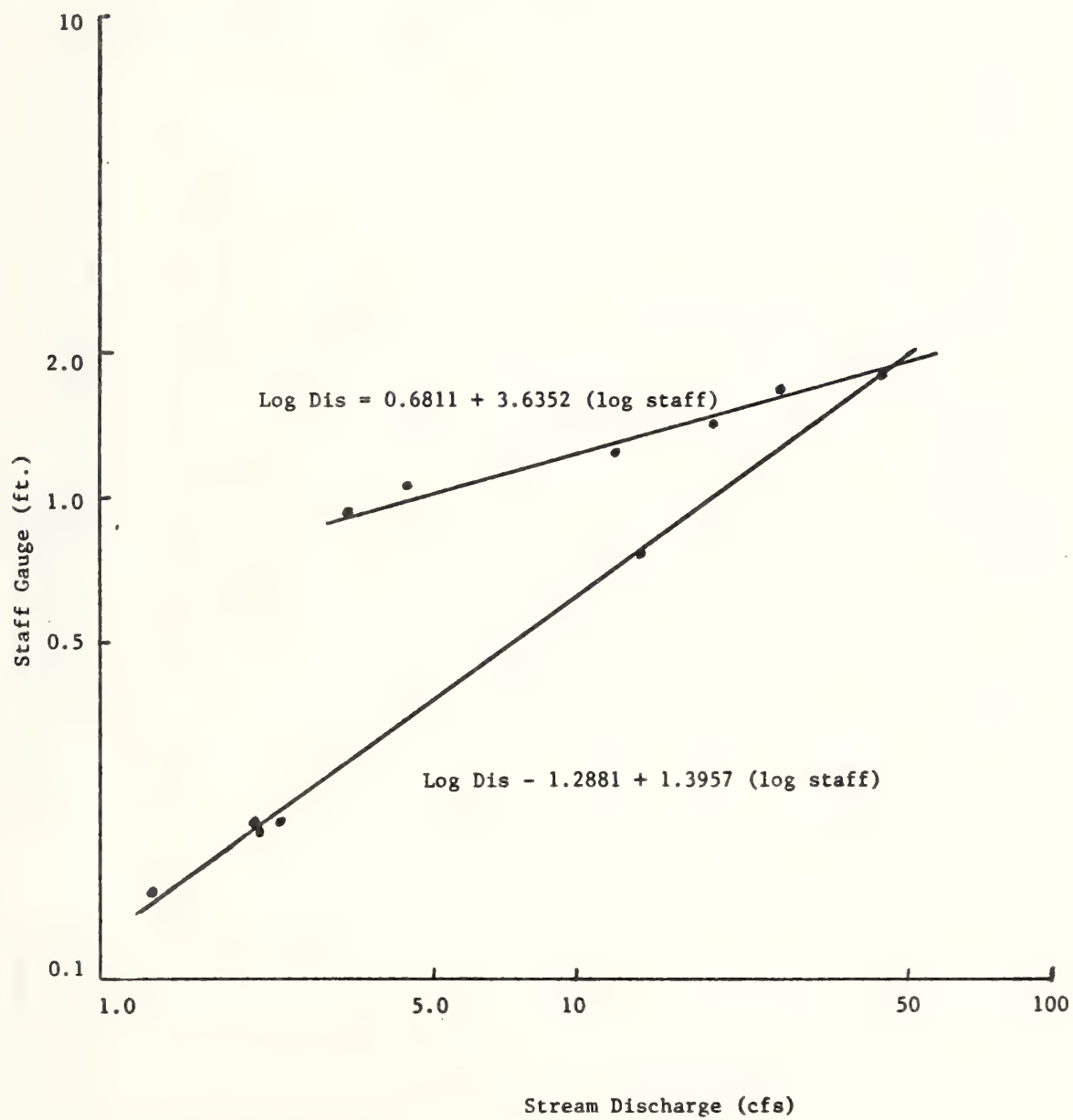


Figure 83. Staff-discharge Rating Curve for the Upper Black Canyon Station.

FIGURE 84. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER BLACK CANYON - 1977

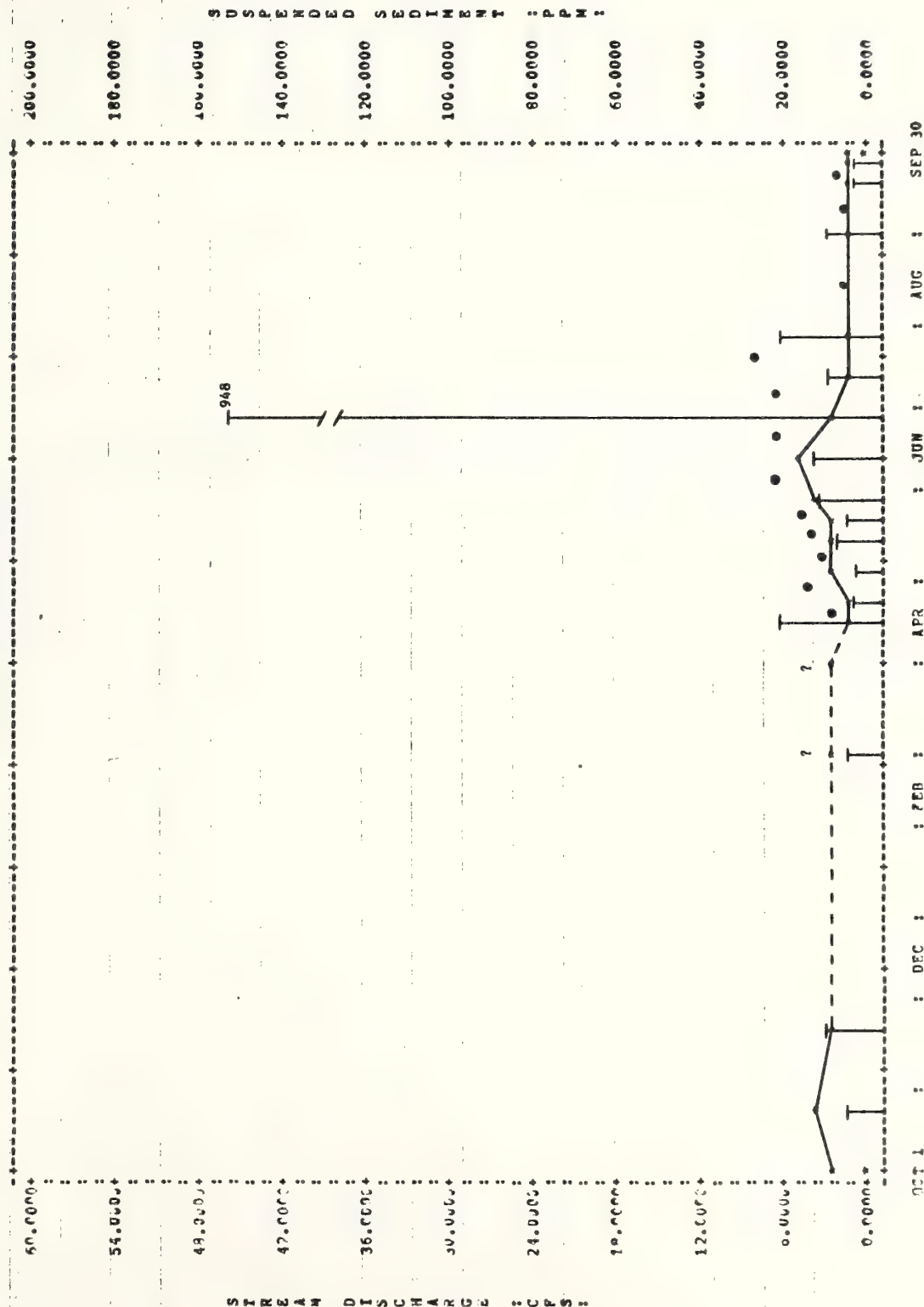


FIGURE 85. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER BLACK CANYON - 1978

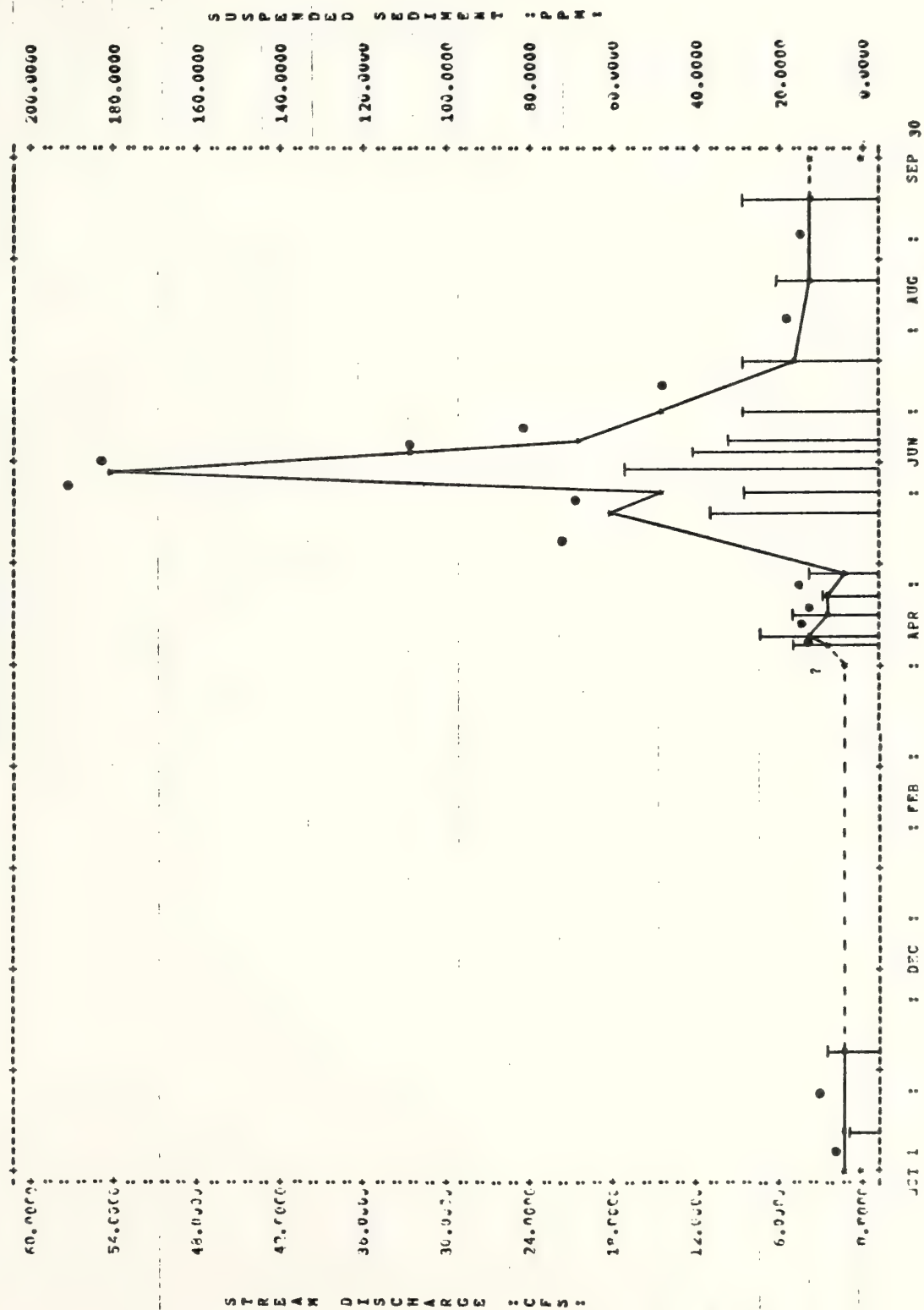


FIGURE 86. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER BLACK CANYON - 1977

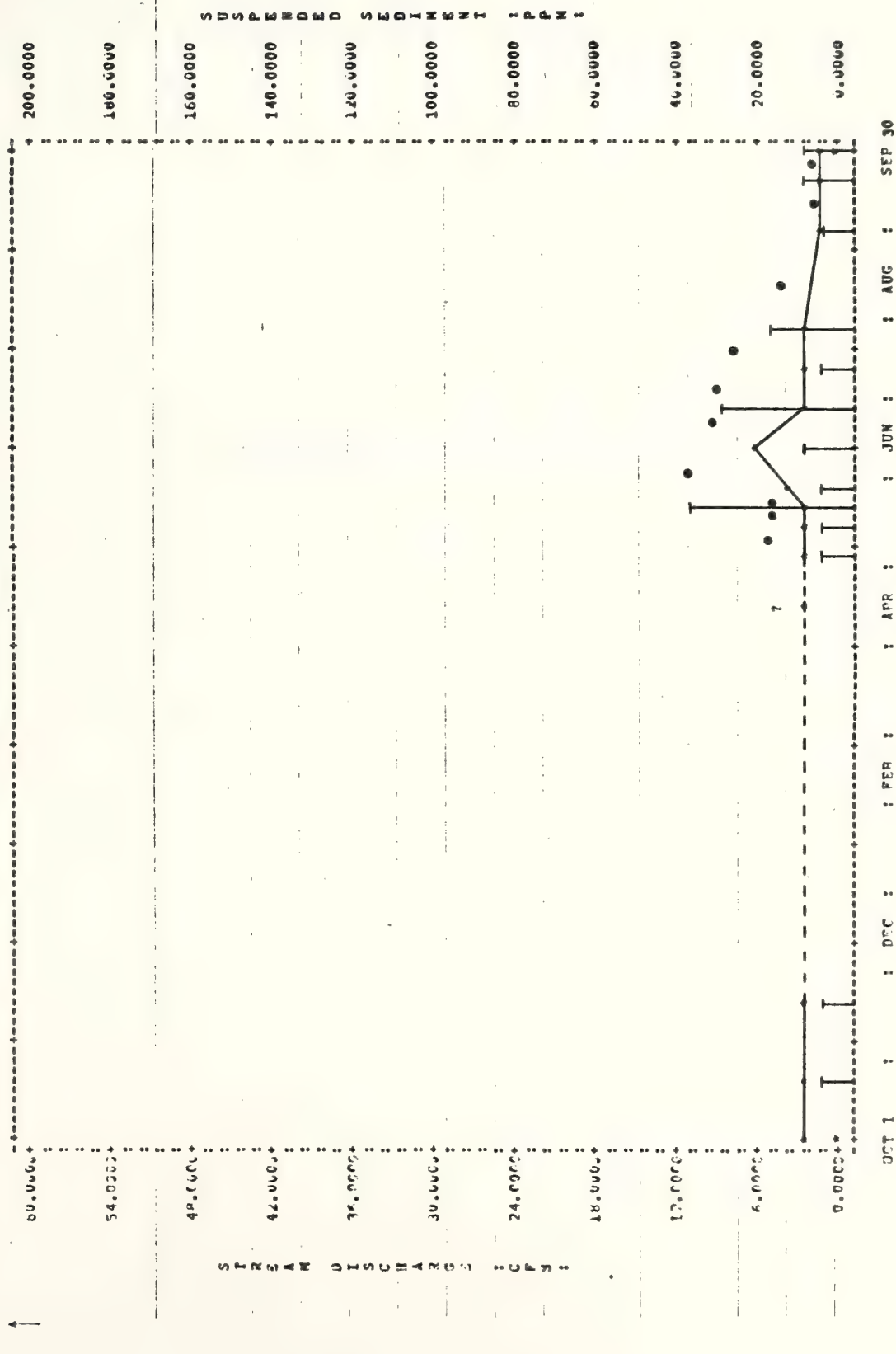


FIGURE 87. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER BLACK CANYON - 1978

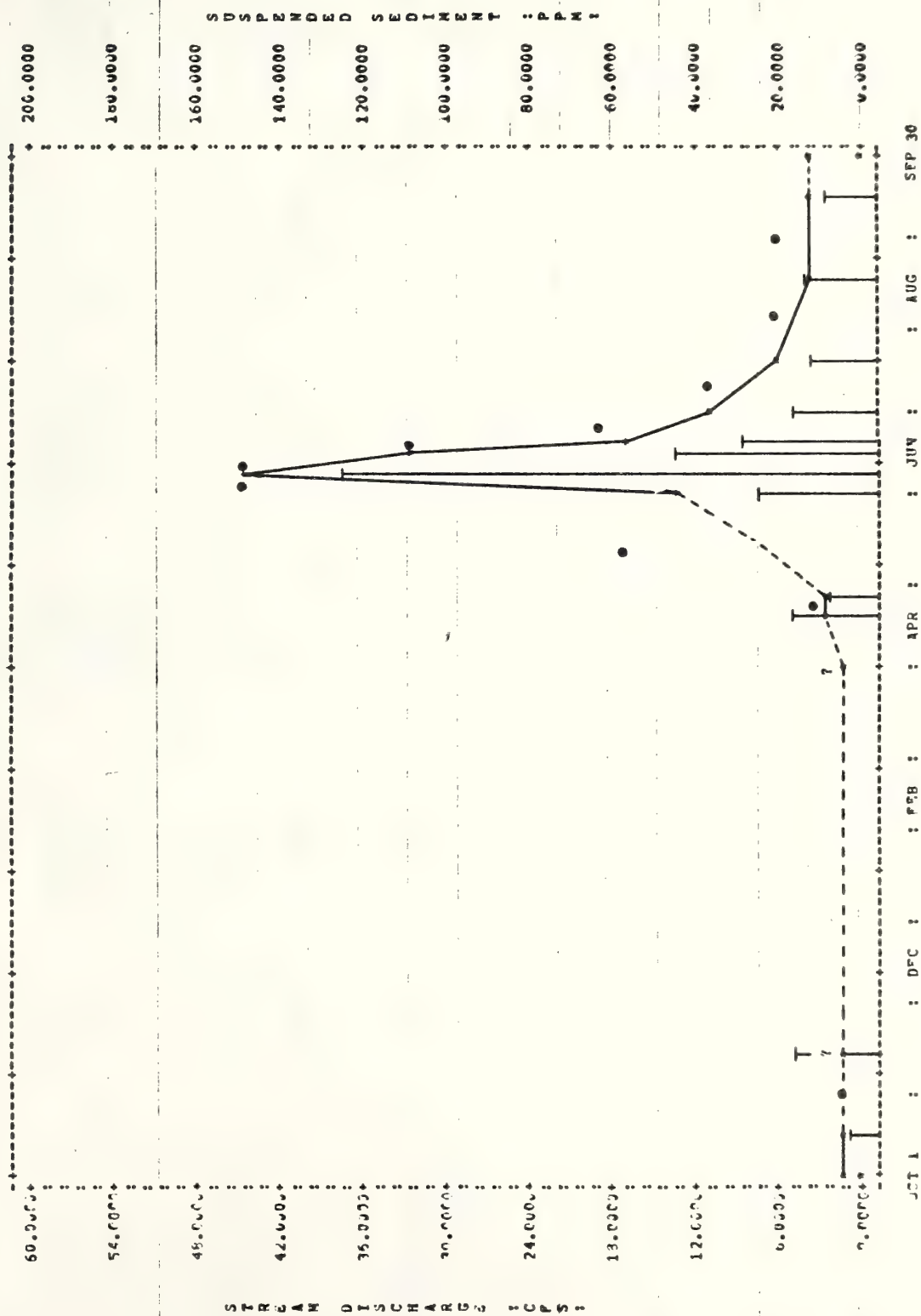


Table 21. Estimated Water and Sediment Yields for Black Canyon, 1977 - 1978.

Station Name	Water Year	Estimated Water Yield (ac. - ft.)	Estimated Sediment Yield (tons)	Contributing Watershed (acres)	Runoff (in./ac.)	Sediment Yield (lbs/acre)
Lower Black Canyon Station	1977	1,890	21	7,330	3.09	5.81
	1978	3,810	172	7,330	6.23	46.9
Upper Black Canyon Station	1977	1,590	18	4,880	3.97	7.43
	1978	3,330	180	4,880	8.31	75.0

Suspended Sediment

The annual patterns of sediment concentrations for each station by hydrologic year are depicted in Figures 84-87. Suspended sediment concentrations at the Lower Black Canyon station ranged from < 5 ppm at low flow to a high of 948 ppm, while those for the Upper station ranged from < 5 ppm to 126 ppm. Higher suspended sediment values were recorded during the 1978 hydrologic year when there were higher discharge values. The relationships between suspended sediment and stream discharge for each station were statistically significant, and are presented in Figures 88 and 89. The variability in sediment concentration with stream flow is partially attributed to a seasonal effect, specific storm effects, presence of livestock, and to the hysteresis effect, whereby peak concentrations of suspended sediment generally occur prior to peak runoff during the rising stage (Gregory and Walling, 1973, pp. 215-219). Annual sediment yields for the two sample stations were estimated from respective water yield and sediment concentration data (Table 21). The Lower and Upper stations produced approximately 21 tons and 18 tons of suspended sediment respectively during 1977. These yields were increased to 172 tons and 180 tons for the more active 1978 hydrologic year. The newly formed beaver pond above the Lower station is believed to have influenced that station's sediment yield values.

Hydrochemical Parameters

The concentration of dissolved solids is inversely related to stream discharge so that lower concentrations occur during periods of high runoff, while higher concentrations are found during periods of low summer base flow (Gunnerson, 1967; Gregory and Walling, 1973, pp. 219-225). Patterns for specific ions, especially the ecologically important ones, often vary from this generalization (Likens, et al., 1977, pp. 74-76).

FIGURE 88. SUSPENDED SEDIMENT VS STREAM DISCHARGE - LOWER BLACK CANYON

LOG SED = 0.888 + 0.4927(LOG DIS)

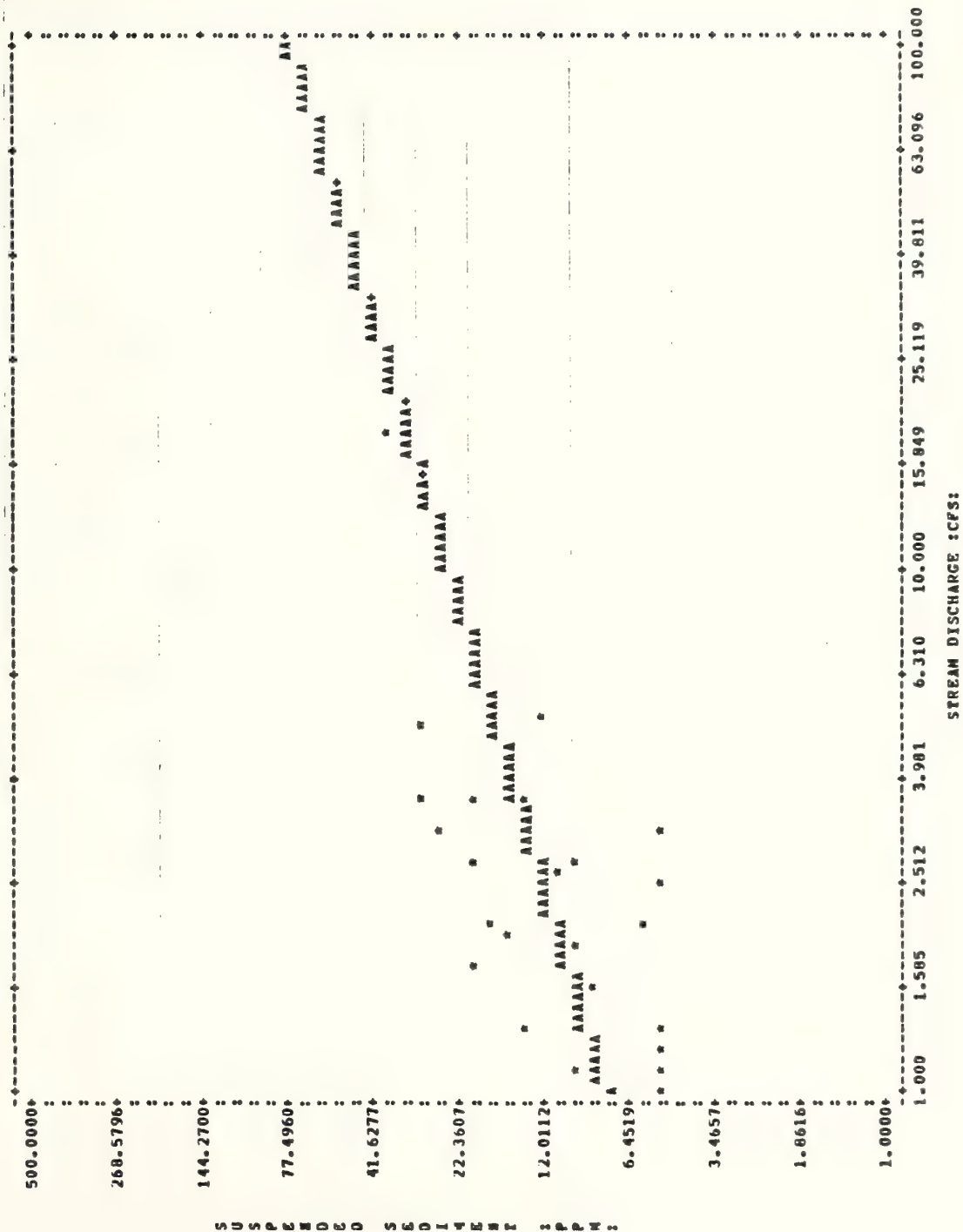
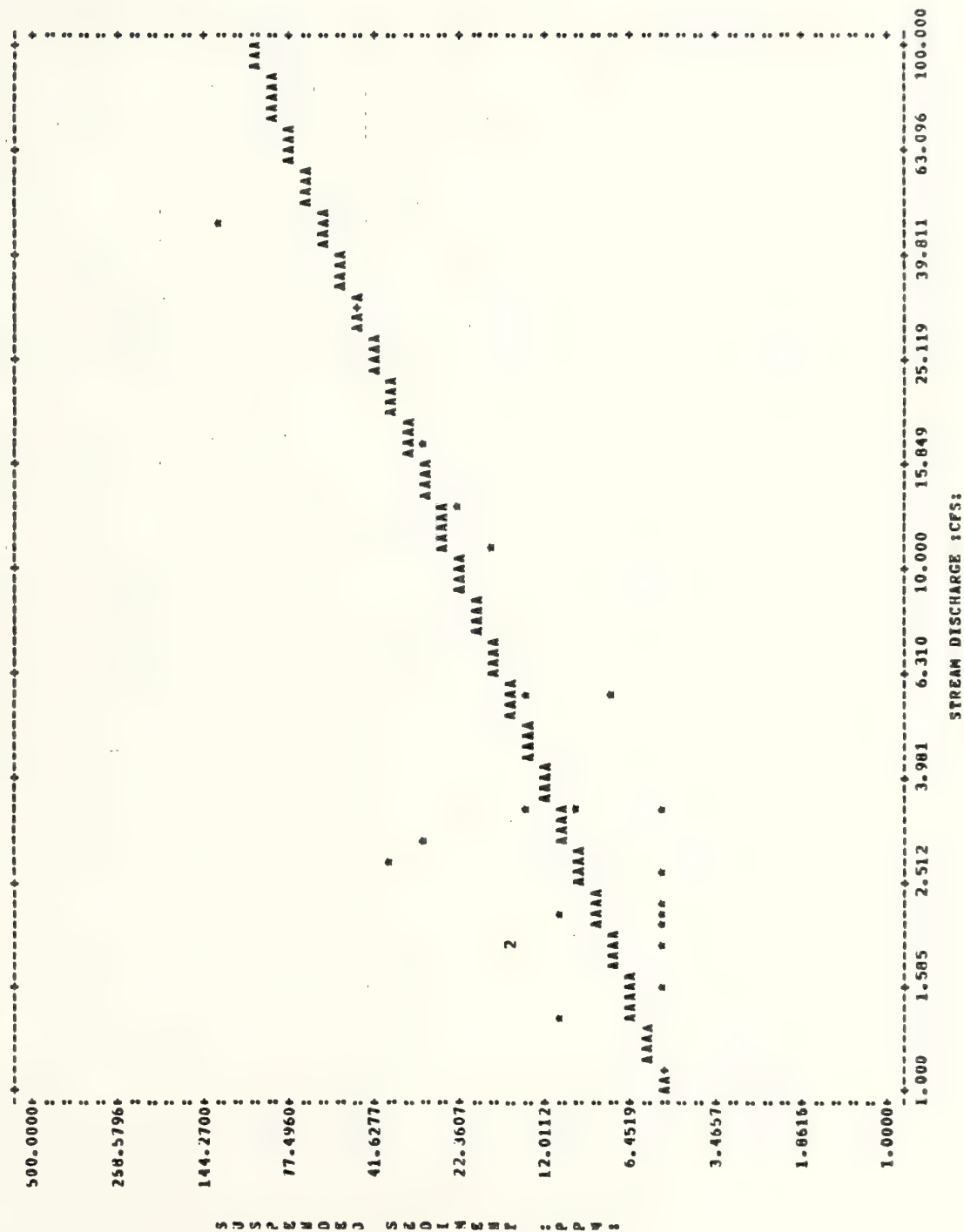


FIGURE 89. SUSPENDED SEDIMENT VS STREAM DISCHARGE - UPPER BLACK CANYON

LOG SED = 0.6912 + 0.659(LOG DIS)



Specific conductance for the Lower Black Canyon station ranged from a low of 65 μ mhos during high spring runoff to a high of 185 μ mhos during summer base flow. The Upper Black Canyon station exhibited a similar pattern, values ranging from 55 μ mhos to a high of 164 μ mhos. The relationships between specific conductance and stream discharge for each station were statistically significant and are presented in Figures 90 and 91. Variation in specific conductance with stream discharge is partially attributed to seasonal and storm hysteresis effects (Gregory and Walling, 1973, pp. 219-225). The ranges in ionic concentration for specific ions are presented in Table 22.

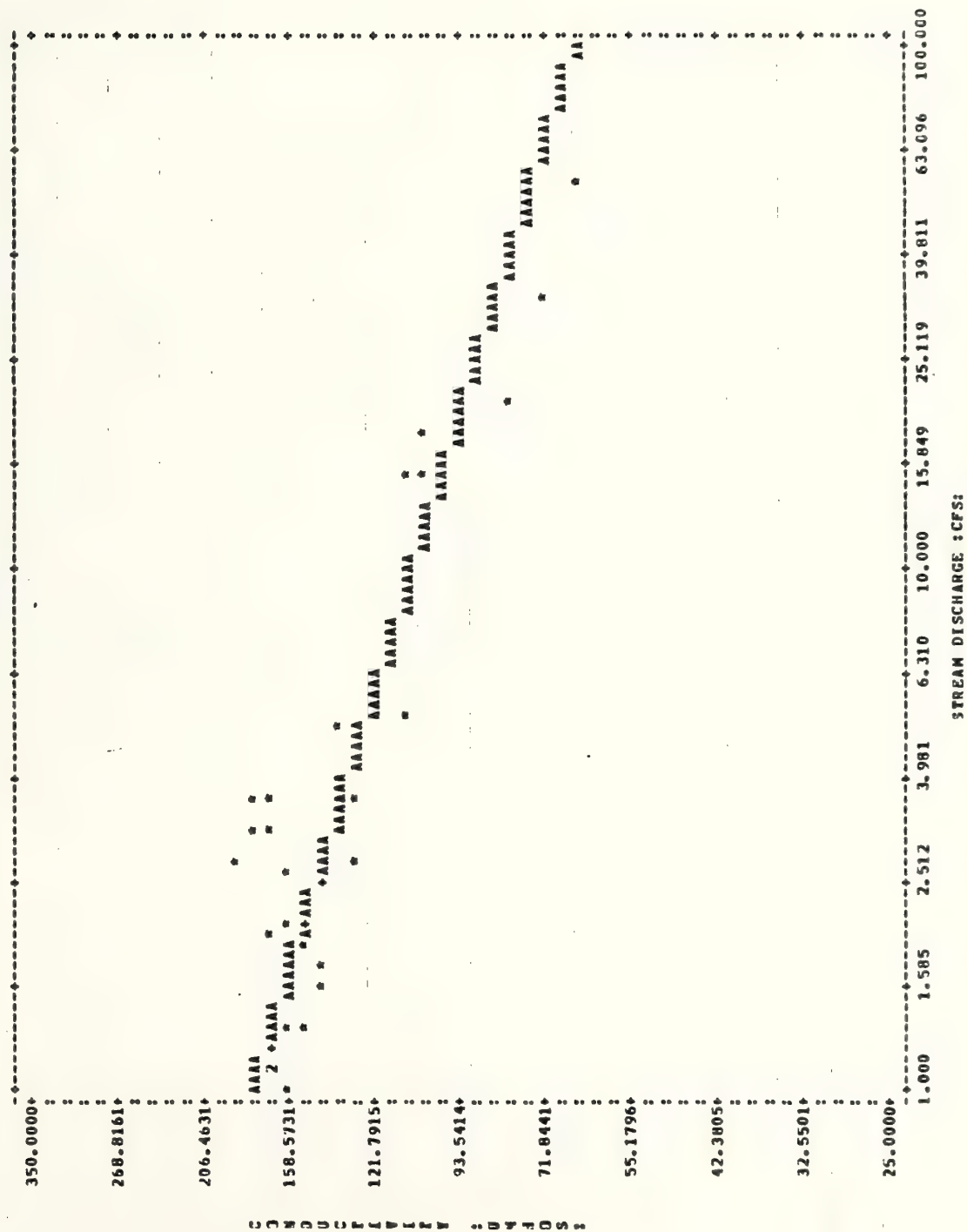
Bacteria Levels

The concentration of fecal and total coliform in streams draining rangeland watersheds is directly related to the number of cattle present, their access to the stream, the physical and hydrological characteristics of the basin, local weather conditions (Kunkle, 1970; Stephensen and Street, 1978), and the time of day (Kunkle and Meiman, 1968). Seasonal patterns include a spring "flushing" effect during the rising state (Kunkle and Meiman, 1968), with high counts during the low flow summer period, counts which often continue for some period after the cattle have been removed from the area (Stephensen and Street, 1978). This seasonal pattern may briefly be modified by local storms which produce their own "flushing" effect, and which may or may not be followed by a short term dilution period.

The concentrations of fecal coliform for the Lower and Upper Black Canyon stations for the study period are presented in Table 23. Higher values occurred during the grazing season, especially with the known presence of livestock. Maximum fecal coliform levels were 292 and 266 colonies/100 mls respectively for each station. Approximately 15 percent and 8 percent of

FIGURE 90. CONDUCTIVITY VS STREAM DISCHARGE - LOWER BLACK CANYON

LOG COND = 2.2504 - 0.2168(LOG DIS)



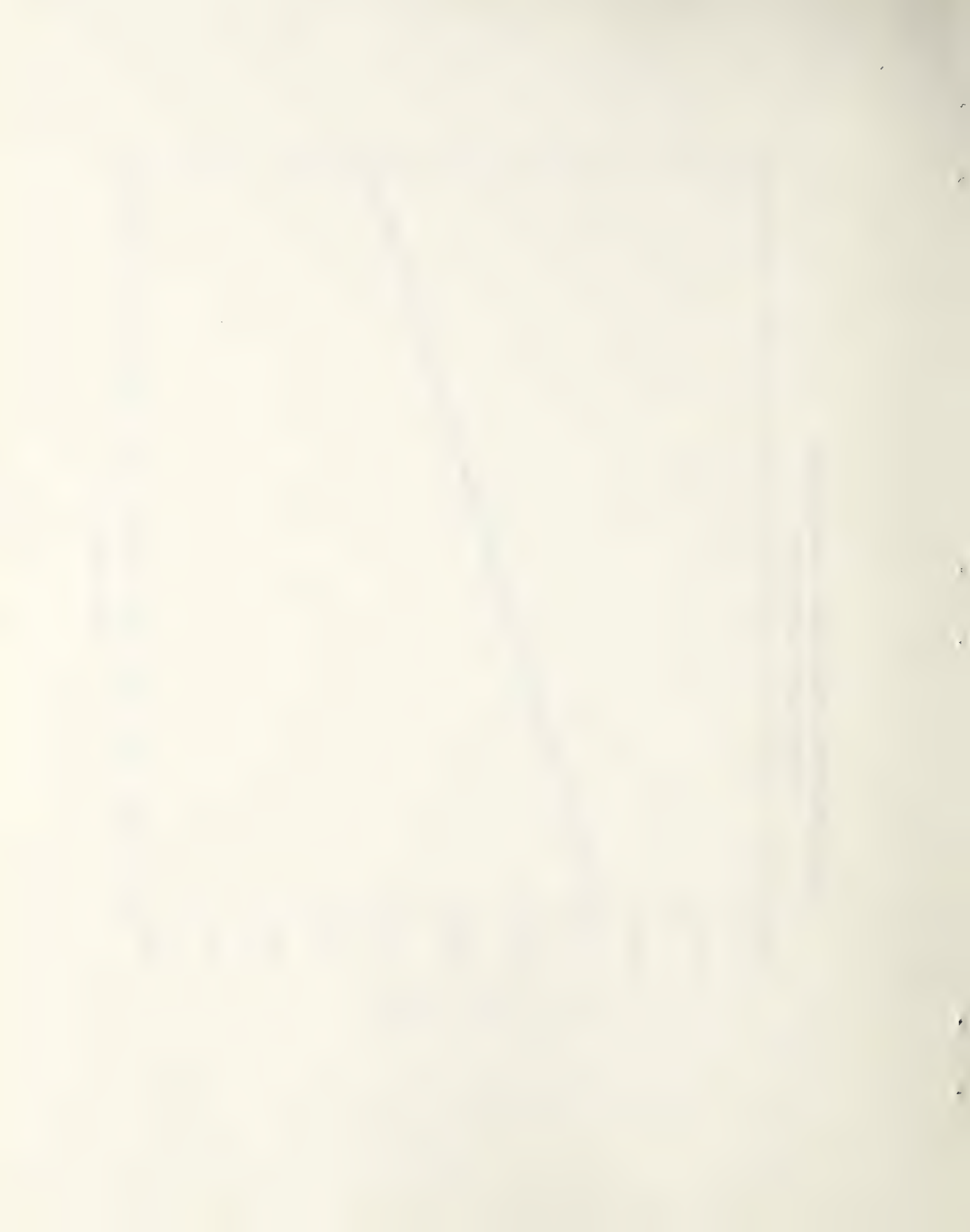
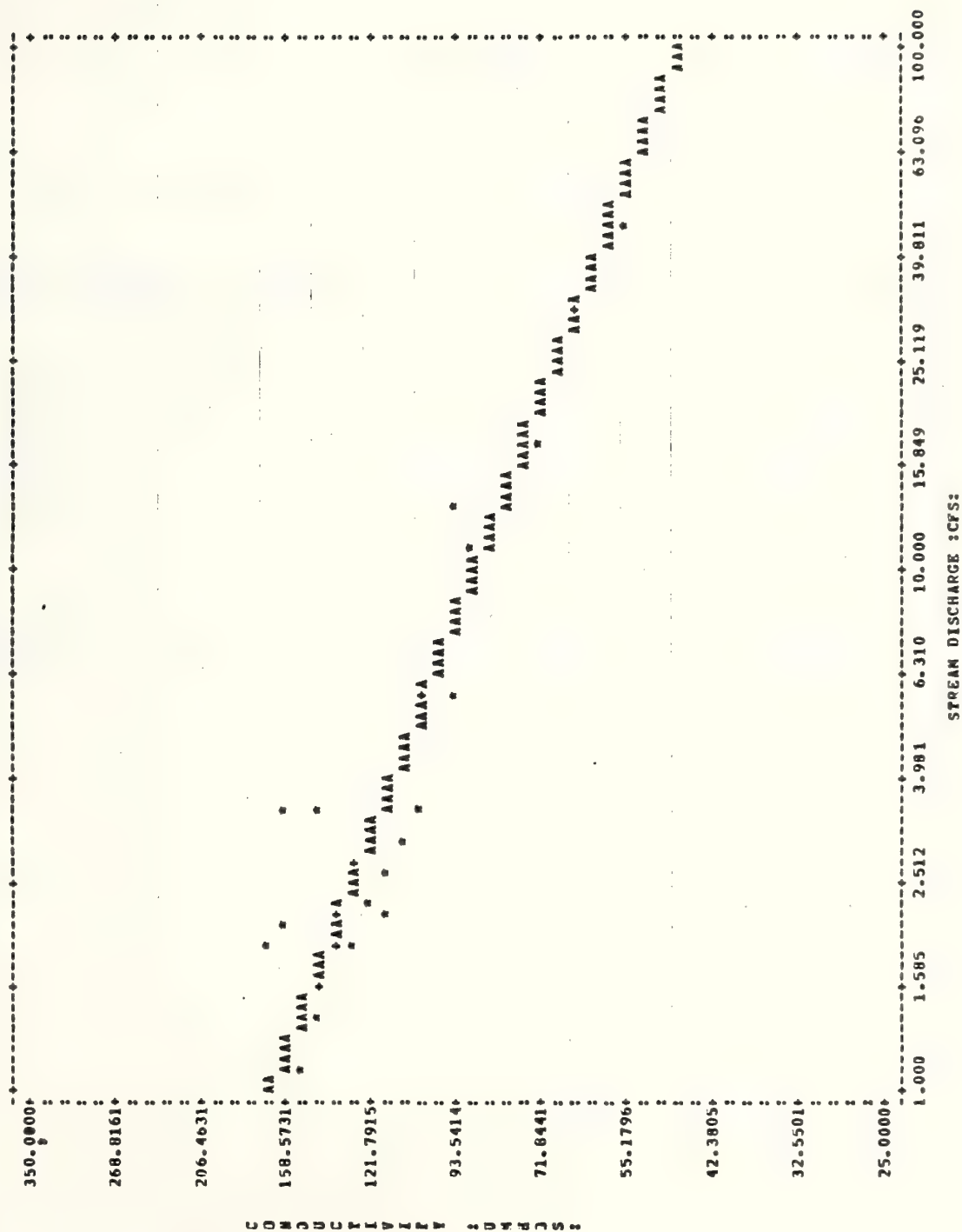


FIGURE 91. CONDUCTIVITY VS STREAM DISCHARGE - UPPER BLACK CANYON

LOG COND = 2.2189 - 0.2734(LOG DIS)



STREAM DISCHARGE :CFS:

Table 22. Ranges of Hydrochemical Characteristics of the Black Canyon Watershed Sampling Stations, 1977 - 1978.

	Lower Black Canyon	Upper Black Canyon
pH	7.00 - 7.82	6.93 - 7.90
Alkalinity (CaCO_3) (mg/l)	41 - 101	37 - 80
Specific Conductance (μmhos)	65 - 185	55 - 164
Total Dissolved Solids (mg/l)	42 - 120	36 - 107
Ca (mg/l)	12 - 25	12 - 22
Mg (mg/l)	5.1 - 11	4.8 - 9.1
Na (mg/l)	2.5 - 4.7	2.1 - 4.4
K (mg/l)	0.95 - 3.1	0.67 - 1.7
HCO_3 (mg/l)	49 - 123	44 - 98
SO_4 (mg/l)	1 - 6	< 1 - 4
NH_4 (mg/l)	< 0.01 - 0.10	0.01 - (0.68)
$\text{NO}_2 + \text{NO}_3 - \text{N}$ (mg/l)	< 0.01 - 0.08	< 0.01 - 0.23
PO_4^2 (Ortho) - P (mg/l)	0.002 - 0.036	0.001 - 0.026

Table 23. Fecal Coliform Counts (colonies/100 mls) for the Black Canyon Sampling Stations, 1977 - 1978.

	Lower Black Canyon		Upper Black Canyon	
	1977	1978	1977	1978
April		< 10		< 10
May	2	5	1	n.s.
June	292*	93	16(?)	< 1
July	91*	89*	71(?)	86(?)
August	46*	241*	266(?)	161*
September	11*	171(?)	3	197(?)
October	10		3	
November	8		62	

* Stock visually present.

(?) Stock presence uncertain.

the sample coliform counts exceeded the 200 colony/100 ml limit of the Montana Water Quality Criteria. Low values were primarily associated with the spring and fall seasons.

Comments

The differences in the flow regimes between the two sample years explain the over two-fold increase in water yield during 1978. The high peak flow of June, 1978 moved considerable bed load. Fresh stream gravel deposits are common along much of the watercourse. The Lower station may have been spared such alteration owing to the nearly formed beaver pond. Livestock along the lower stream course, however, apparently contributed to elevated sediment concentration and fecal coliform levels. Because of the limited number of samples taken and the nature of the hydrochemical parameters evaluated, relationships between the water quality of Black Canyon Creek and the Montana Water Quality Criteria cannot be addressed.

Nip and Tuck Creek Basin

The Nip and Tuck Creek sample basin was visited a total of 15 and 17 times during the two hydrologic years. Impassable road conditions and inclement weather made the Upper station inaccessible on several occasions. The Upper Nip and Tuck station was monitored 13 and 11 times respectively.

Channel Stability Ratings

The portion of Nip and Tuck from above the Beaverhead National Forest boundary to the Bannock Pass road was evaluated on September 1, 1976. The creek was rated as 'fair' (94) (Table 24).

Table 24 R-1 STREAM CHANNEL STABILITY FIELD EVALUATION FORM

Nip and Tuck

9/1/76

Item Rated	Stability Indicators by Classes				
	EXCELLENT	GOOD	FAIR	POOR	
I. UPPER BANKS					
Landform Slope	Bank slope gradient <30%.	Bank slope gradient 30-40%.	Bank slope gradient 40-60%.	Bank slope gradient 60% +	8
Mass Wasting (Existing or Potential)	No evidence of past or potential for future mass wasting into channels.	Infrequent and/or very small, mostly healed over. Low future potential.	Moderate frequency & size, with some raw spots eroded by water during high flows.	Frequent or large, causing sediment nearly yearlong OR imminent danger of same.	1/2
Debris Jam Potential (Floatable Objects)	Essentially absent from immediate channel area.	Present but mostly small twigs and limbs.	Present, volume and size are both increasing.	Moderate to heavy amounts, predominantly larger sizes.	8
Bank Protection	90% + plant density. Vigor and variety suggests a deep, dense root mass.	70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass.	50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	<50% density plus fewer species & less vigor indicate poor, discontinuous, and shallow root mass.	1/2
Vegetation					
II. LOWER BANKS					
Channel Capacity	Ample for present plus some increases. Peak flows contained, W/D ratio <7.	Adequate. Overbank flows infrequent, width to depth (W/D) ratio 8-15.	Barely contains present peaks. Occasional overbank floods, W/D ratio 15-25.	Inadequate. Overbank flows common. W/D ratio >25.	4
Bank Rock Content	65% + with large, angular boulders 12" + numerous.	40 to 65%, mostly small boulders to cobble 6-12".	20 to 40%, with most in the 3-6" diameter class.	<20% rock fragments of gravel sizes, 1-3" or less.	8
Obstructions	Rocks, old logs firmly embedded. Flow pattern of pool & riffles stable without cutting or deposition.	Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm.	Moderately frequent, moderately unstable obstructions and deflectors move with high water causing bank cutting and filling of pools.	Frequent obstructions and deflectors cause bank erosion yearlong. Sed. traps full, channel migration occurring.	8
Flow Deflectors					
Sediment Traps					
Cutting	Little or none evident. Infrequent raw banks less than 6" high generally.	Some, intermittently at outcrops & constrictions. Raw banks may be up to 12".	Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident.	Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16
Deposition	Little or no enlargement of channel or point bars.	Some new increases in bar formation, most from coarse gravels.	Moderate deposition of new gravel & coarse sand on old and some new bars.	Extensive deposits of predominantly fine particles. Accelerated bar development.	13
III. BOTTOM					
Rock Angularity	Sharp edges and corners, plane surfaces roughened.	Rounded corners & edges, surfaces smooth & flat.	Corners & edges well rounded in two dimensions.	Well rounded in all dimensions, surfaces smooth.	4
Brightness	Surfaces dull, darkened, or stained. Gen. not "bright".	Mostly dull but may have up to 35% bright surfaces.	Mixture, 50-50% dull and bright, ± 15%, ie 35-65%.	Predominately bright, 65% + exposed or scoured surfaces.	4
Consolidation or Particle Packing	Assorted sizes tightly packed and/or overlapping.	Moderately packed with some overlapping.	Mostly a loose assortment with no apparent overlap.	No packing evident. Loose assortment, easily moved.	8
Bottom Size Distribution	No change in sizes evident. Stable materials 80-100%.	Distribution shift slight. Stable materials 50-80%.	Moderate change in sizes. Stable materials 20-50%.	Marked distribution change. Stable materials 0-20%.	16
Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition.	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	More than 50% of the bottom in a state of flux or change nearly yearlong.	24
Clinging Aquatic Vegetation (Moss & Algae)	Abundant. Growth largely moss like, dark green, perennial. In swift water too small.	Common. Algal forms in low velocity & pool areas. Moss here too and swift waters.	Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4
COLUMN TOTALS	5	12	56	56	

Add the values in each column for a total reach score here. (5 + 12 + 56 + 56 = 129)

Reach score of: (38=Excellent, 39-76=Good, 77-114=Fair, 115+=Poor.)

RI-2500-3 (6)

Stream Discharge

The staff-discharge rating curves for the Lower Nip and Tuck and Upper Nip and Tuck sampling stations are presented in Figures 92 and 93. The gauging sites remained nearly stable during the two sampling years. Channel bed conditions created a threshold value in the staff-discharge rating curve at low flow values for the Upper station.

The 1977 and 1978 annual hydrographs for the Lower Nip and Tuck and Upper Nip and Tuck Creek sampling stations are presented in Figures 94-97. Peak flow during 1977 at the Lower Nip and Tuck station apparently occurred in late April at 3.4 cfs, although a higher flow may have taken place prior to the first sampling visit. The lowest recorded flow during 1977 was only 0.54 cfs during September. The 1978 year produced an early peak flow at 8.8 cfs in mid-May which preceeded the seasonal peak discharge of approximately 12 cfs in mid-June. The lowest recorded flow for 1978 was 0.54 cfs in early May. The Upper Nip and Tuck station exhibited a nearly constant flow pattern for 1977, although a definitive annual peak discharge may have occurred prior to the initial sampling visit. The flow regime ranged from 1.3 cfs to 0.43 cfs for 1977. During 1978, however, a crest stage flow of 9.5 occurred in mid-June, while the lowest flow was recorded at 0.57 cfs in the previous October. The differences noted in flow patterns for the two hydrologic years are largely attributed to differences in the annual precipitation and snow melt patterns.

The respective annual hydrograph data were used to estimate the annual water yields for each station (Table 25). Water yields for Lower and Upper Nip and Tuck for 1977 were estimated at 879 acre feet and 614 acre feet respectively. These values increased in 1978 to 977 acre feet and 865 acre feet.

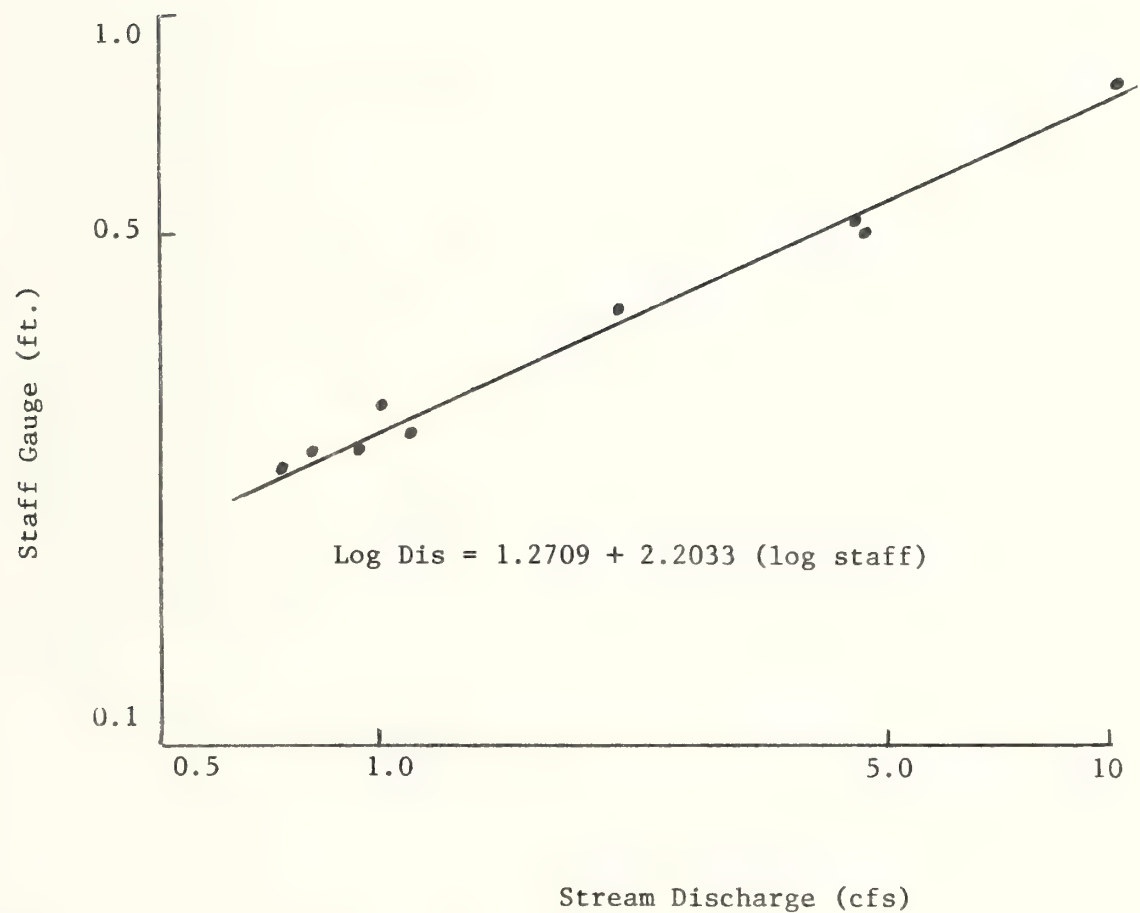


Figure 92. Staff-discharge Rating Curve for the Lower Nip and Tuck Station.

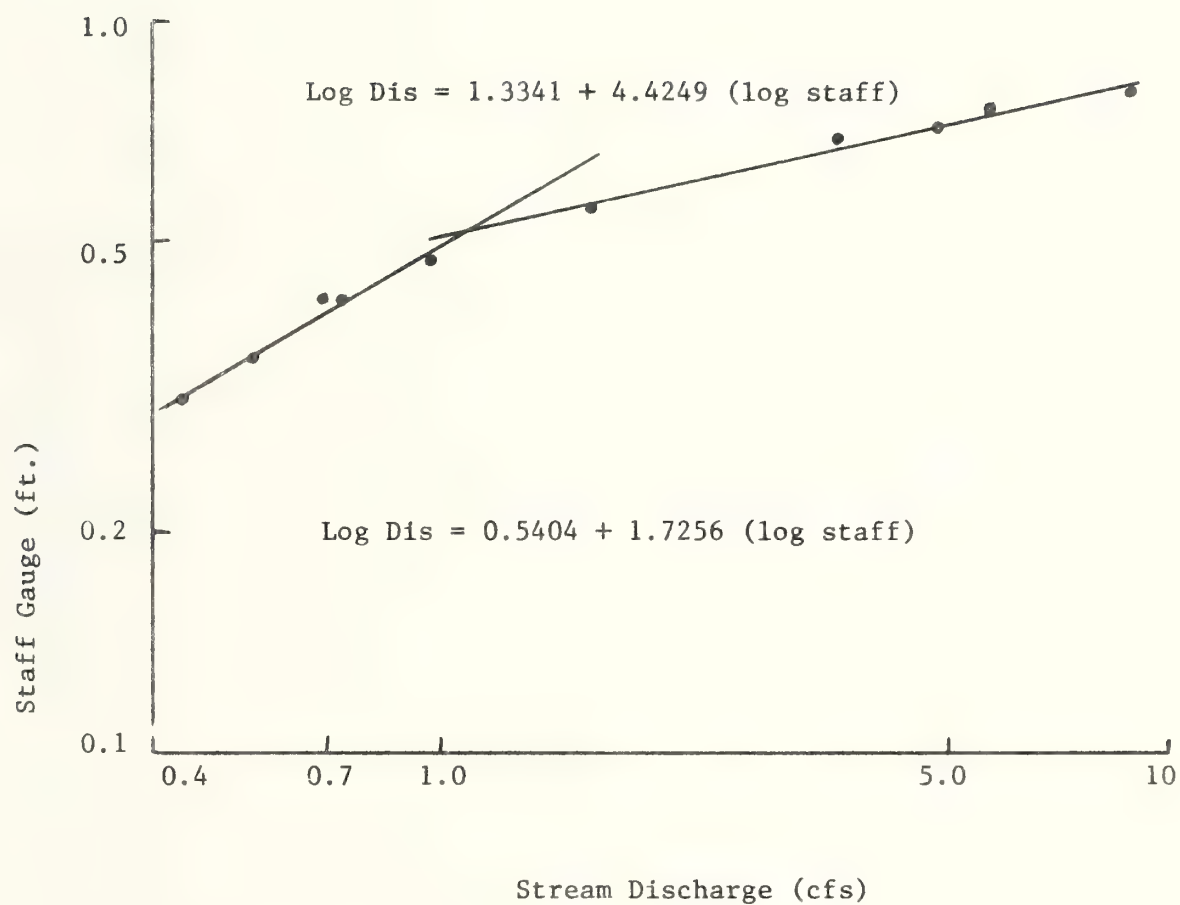
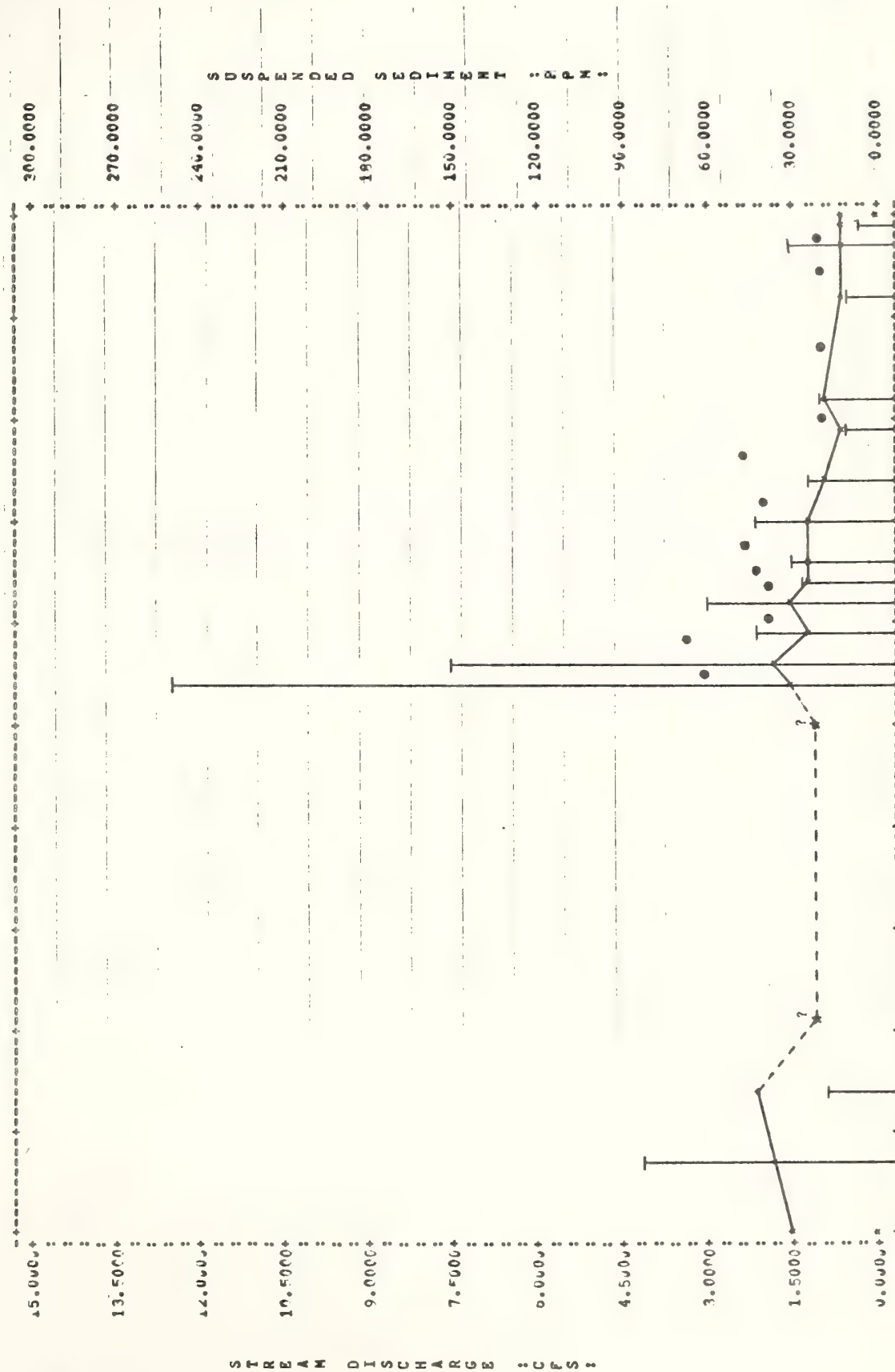


Figure 93. Staff-discharge Rating Curve for the Upper Nip and Tuck Station.

Figure 94

ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS

LOWER NIP & TUCK - 1977



OCT 1 : DEC : JAN : FEB : MAR : APR : MAY : JUN : JUL : AUG : SEP 30

FIGURE 95. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER NIP & TUCK - 1978

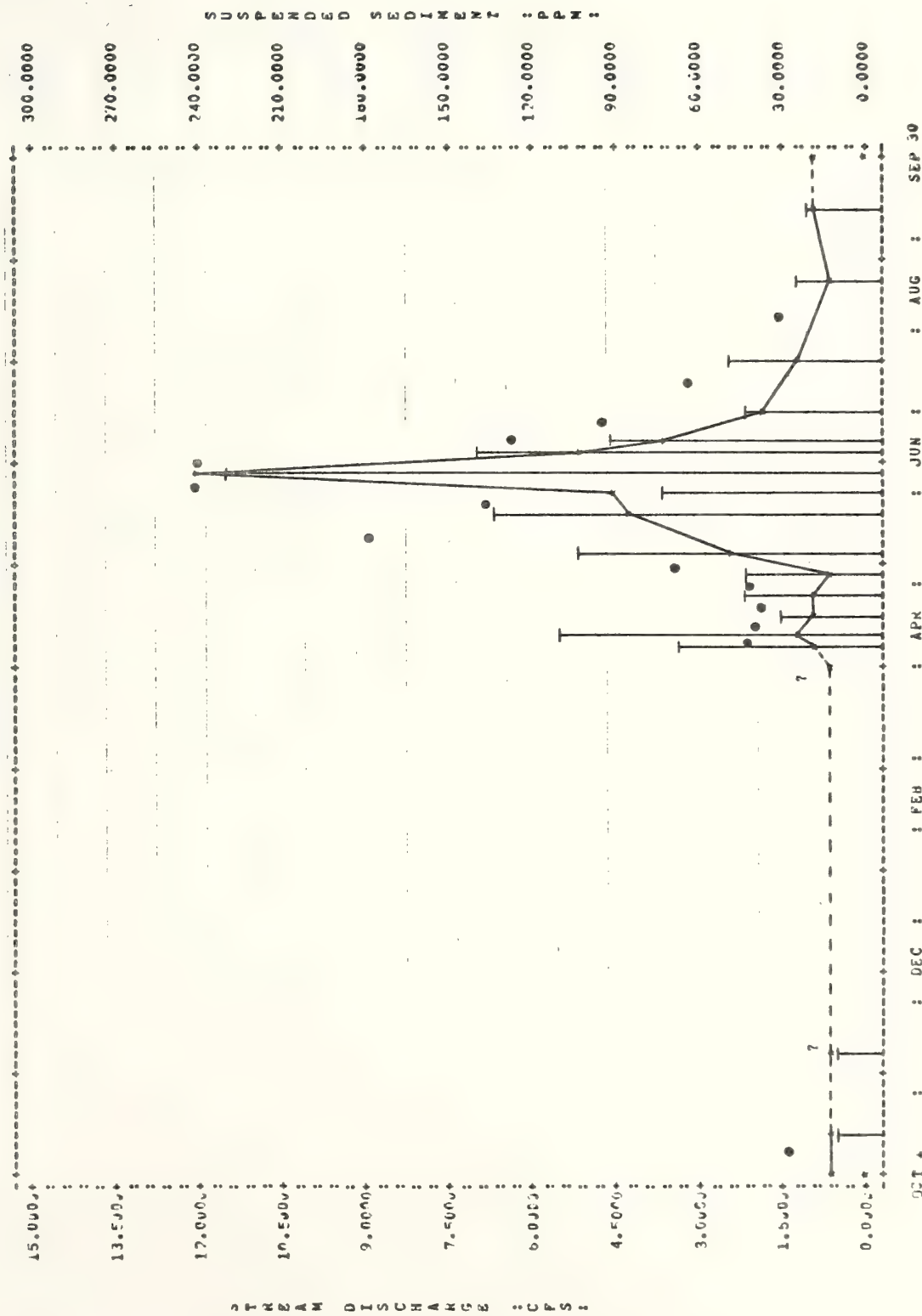


FIGURE 96. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER NIP & TUCK - 1977

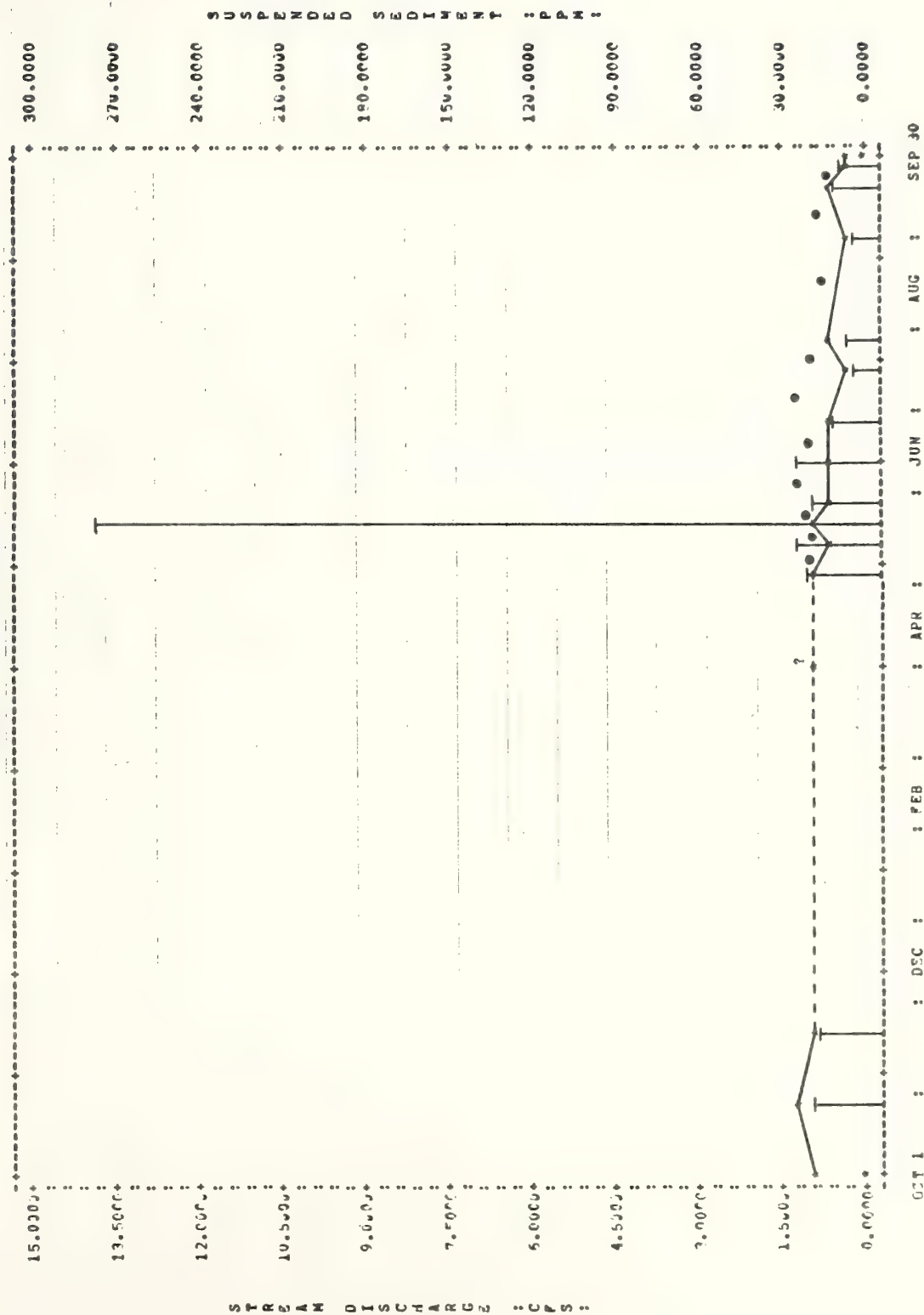


FIGURE 97. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS

UPPER NIP & TUCK - 1978

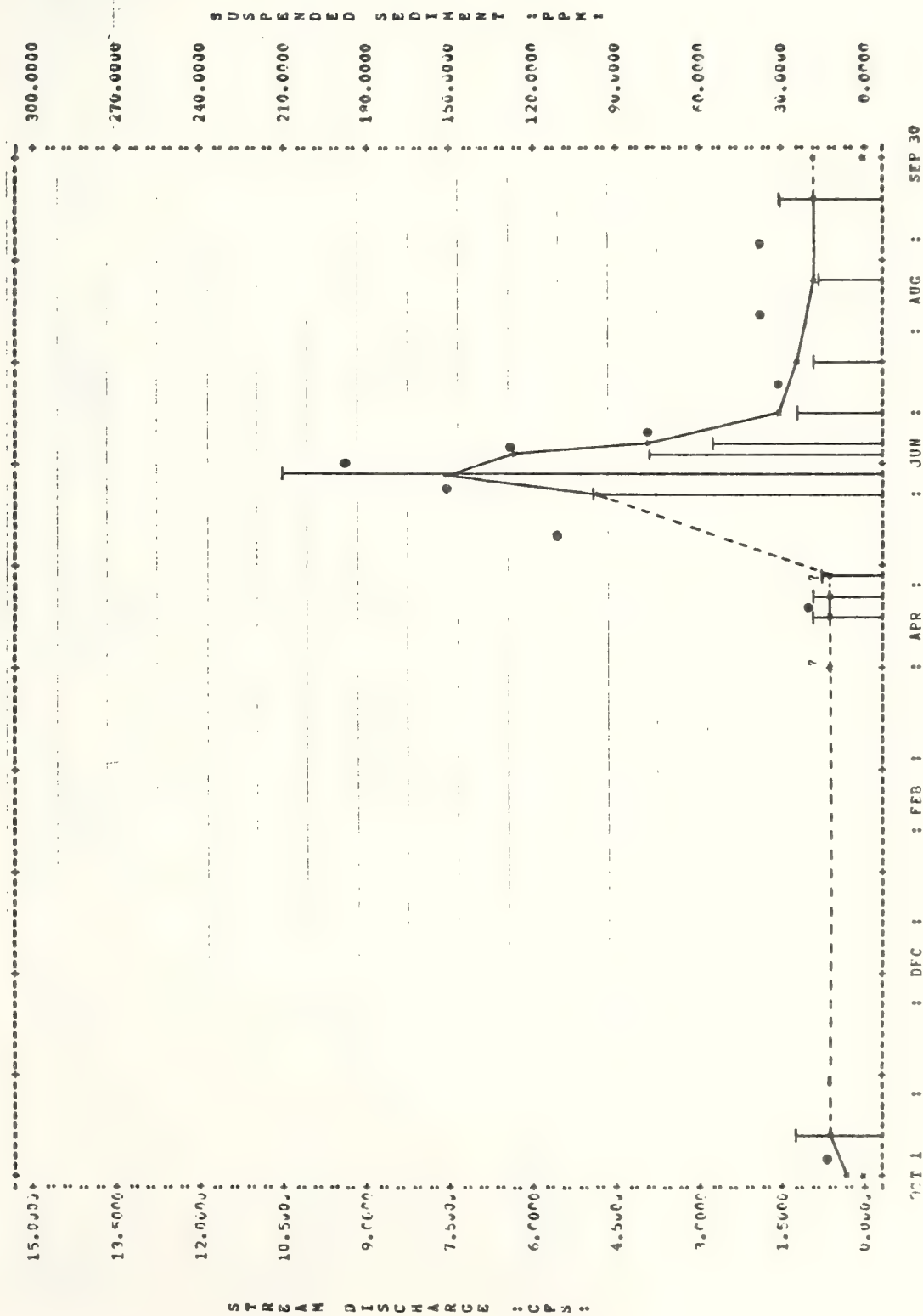


Table 25. Estimated Water and Sediment Yields for Nip and Tuck Cree, 1977 - 1978.

Station Name	Water Year	Estimated Water Yield (ac. - ft.)	Estimated Sediment Yield (tons)	Contributing Watershed (acres)	Runoff (in./ac.)	Sediment Yield (lbs/acre)
Lower Nip and Tuck Station	1977	879	54	4,030	2.62	26.8
	1978	977	116	4,030	2.91	57.6
Upper Nip and Tuck Station	1977	614	18	2,020	3.65	17.8
	1978	865	79	2,020	5.14	78.2

Suspended Sediment

The annual patterns of sediment concentrations for each station by hydrologic year are depicted in Figures 94-97. Suspended sediment concentrations at the Lower Nip and Tuck station ranged from <5 ppm at low flow to a high of 251 ppm, while those for the Upper station ranged from <5 ppm to 276 ppm. The relationships between suspended sediment and stream discharge for each station were statistically significant, and are presented in Figures 98 and 99. The variability in sediment concentration with stream flow is partially attributed to a seasonal effect, specific storm effects, and to the hysteresis effect, whereby peak concentrations of suspended sediment generally occur prior to peak runoff during the rising stage (Gregory and Walling, 1973, pp. 215-219). Annual sediment yields for the two sample stations were estimated from respective water yield and sediment concentration data (Table 25). The Lower and Upper stations produced approximately 54 tons and 18 tons of suspended sediment respectively during 1977. These yields were increased to 116 tons and 79 tons for the more active 1978 hydrologic year.

Hydrochemical Parameters

The concentration of dissolved solids is inversely related to stream discharge so that lower concentrations occur during periods of high runoff, while higher concentrations are found during periods of low summer base flow (Gunnerson, 1967; Gregory and Walling, 1973, pp. 219-225). Patterns for specific ions, especially the ecologically important ones, often vary from this generalization (Likens, et al., 1977, pp. 74-76).

FIGURE 98. SUSPENDED SEDIMENT VS STREAM DISCHARGE - LOWER NIP AND TUCK

$$\text{LOG SED} = 1.4974 + 0.9454(\text{LOG DIS})$$

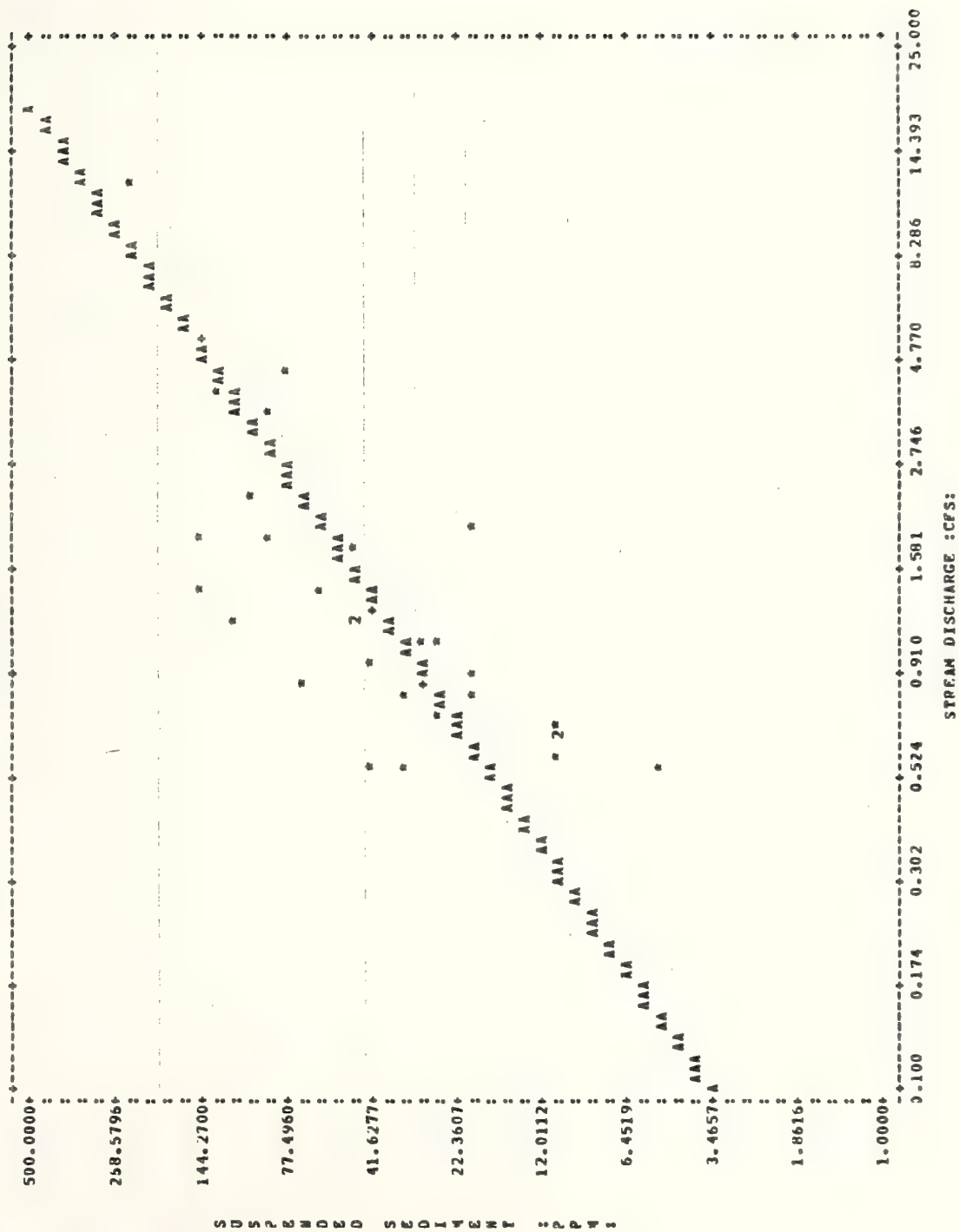
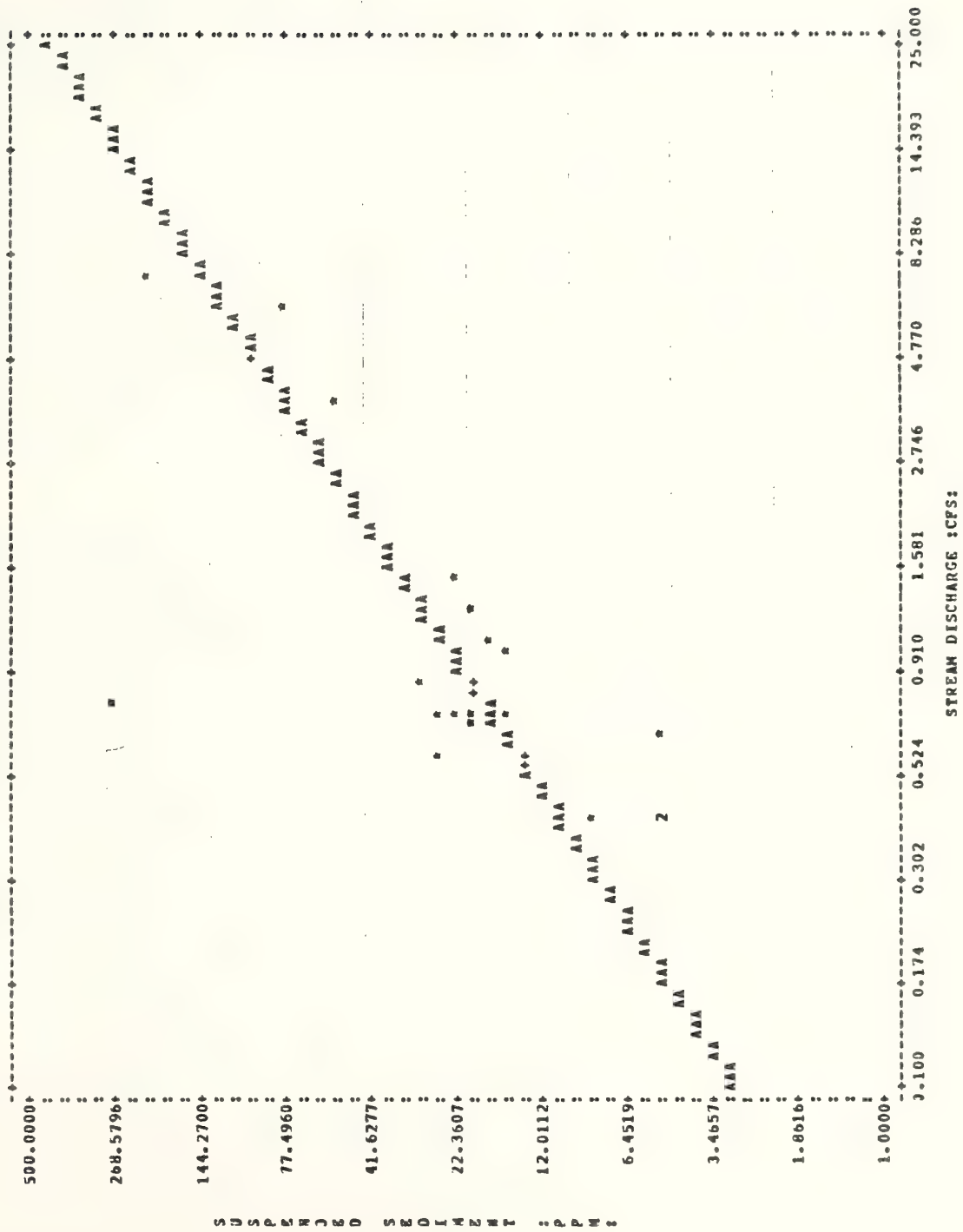


FIGURE 99. SUSPENDED SEDIMENT VS STREAM DISCHARGE - UPPER NIP AND TUCK

LOG SED = 1.3578 + 0.8983(LOG DIS)



Specific conductance for the Lower Nip and Tuck station ranged from a low of 82 μ mhos during high spring runoff to a high of 177 μ mhos during summer base flow. The Upper Nip and Tuck station exhibited a similar pattern, values ranging from 76 μ mhos to a high of 168 μ mhos. The relationships between specific conductance and stream discharge for each station were statistically significant and are presented in Figures 100 and 101. Variation in specific conductance with stream discharge is partially attributed to seasonal and storm hysteresis effects (Gregory and Walling, 1973, pp. 219-225). The ranges in ionic concentration for specific ions are presented in Table 26.

Bacteria Levels

The concentration of fecal and total coliform in streams draining rangeland watersheds is directly related to the number of cattle present, their access to the stream, the physical and hydrological characteristics of the basin, local weather conditions (Kunkle, 1970; Stephensen and Street, 1978), and the time of day (Kunkle and Meiman, 1968). Seasonal patterns include a spring "flushing" effect during the rising stage (Kunkle and Meiman, 1968), with high counts during the low flow summer period, counts which often continue for some period after the cattle have been removed from the area (Stephensen and Street, 1978). This seasonal pattern may briefly be modified by local storms which produce their own "flushing" effect, and which may or may not be followed by a short term dilution period.

The concentrations of fecal coliform for the Lower and Upper Nip and Tuck stations for the study period are presented in Table 27. Higher values occurred during the grazing season, especially with the known presence of livestock. Maximum fecal coliform levels were 1600 and 1290 colonies/100 mls respectively for each station. Approximately 54 percent and 64 percent of

FIGURE 101. CONDUCTIVITY VS STREAM DISCHARGE - UPPER NIP AND TUCK

LOG COND = 2.1451 - 0.2298(LOG DIS)

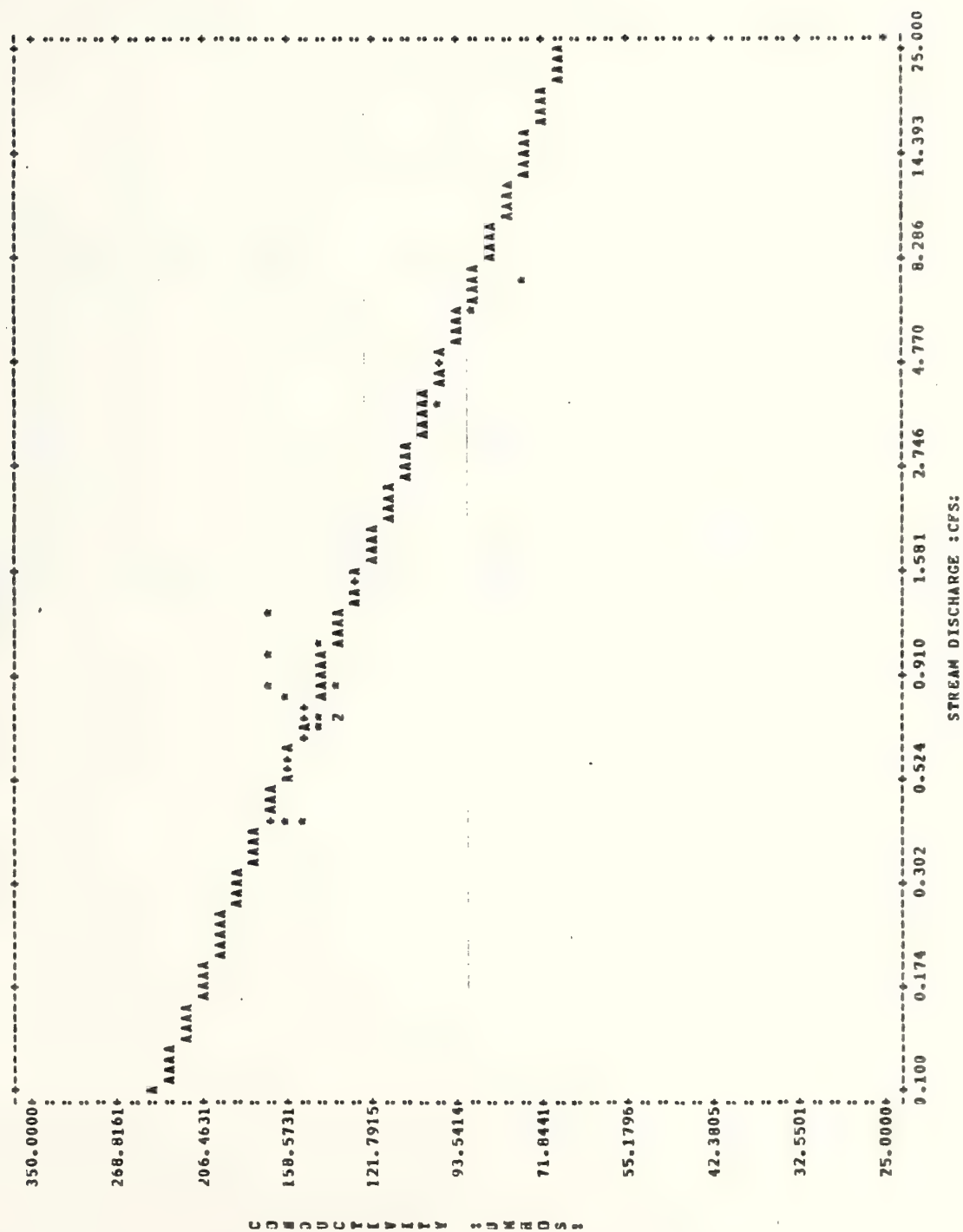


Table 26. Hydrochemical Characteristics of the Nip and Tuck Watershed Sampling Stations, 1977 - 1978.

	Lower Nip & Tuck	Upper Nip & Tuck
pH	7.30 - 8.39	6.89 - 7.80
Alkalinity (CaCO_3) (mg/l)	54 - 99	51 - 88
Specific Conductance (μmhos)	82 - 177	76 - 168
Total Dissolved Solids (mg/l)	53 - 115	49 - 109
Ca (mg/l)	14 - 29	14 - 24
Mg (mg/l)	4.6 - 8.0	4.9 - 9.4
Na (mg/l)	3.0 - 5.7	3.0 - 4.7
K (mg/l)	0.82 - 2.8	0.80 - 2.4
HCO_3 (mg/l)	65 - 121	61 - 107
SO_4 (mg/l)	2 - 4	1 - 4
NH_4 (mg/l)	≤ 0.01 - 0.21	≤ 0.01 - 0.15
$\text{NO}_2 + \text{NO}_3 - \text{N}$ (mg/l)	≤ 0.01 - 0.09	≤ 0.01 - 0.15
PO_4 (Ortho) - P (mg/l)	0.042 - 0.090	0.025 - 0.086

Table 27. Fecal Coliform Counts (colonies/100 mls) for the Nip and Tuck Watershed Sampling Stations, 1977 - 1978.

	Lower Nip & Tuck		Upper Nip & Tuck	
	1977	1978	1977	1978
April		10		20
May	< 2	16	< 2	n.s.
June	< 1(?)	117	542(?)	62*
July	1600*	545(?)	1180*	1290*
August	1200*	667*	460*	273(?)
September	760*	267*	660(?)	153(?)
October	150		205	
November	325			

* Stock visually present.

(?) Stock presence uncertain.

the sample coliform counts exceeded the 200 colony/100 ml limit of the Montana Water Quality Criteria. The lower values were generally associated with the spring season.

Comments

Water yields for the 1978 hydrologic year were not substantially increased. This may be caused, in part, by differences in the winter flow estimates and by the timing of the sampling. Flow regimes, however, between the two sample years were quite different, with higher sediment yields being generated during the more hydrologically active 1978 year. The two stations are quite similar hydrochemically. The presence of cattle along the stream course and its immediate environs is documented by the elevated fecal coliform levels. Because of the limited number of samples taken and the nature of the hydrochemical parameters evaluated, relationships between the water quality of Nip and Tuck Creek and the Montana Water Quality Criteria cannot be addressed.

Divide Creek Basin

The Divide Creek sample basin was visited a total of 16 and 16 times during the two hydrologic years. There were not specific accessibility or sampling problems.

Channel Stability Ratings

The North Divide Creek and South Divide Creek stream sections were evaluated on September 1, 1976. East segment extended from the Bannock Pass road to above the Beaverhead National Forest boundary. North Divide Creek was rated as 'fair' (82) (Table 28), and South Divide Creek as 'good' (73) (Table 29).

Table 28 R-1 STREAM CHANNEL STABILITY FIELD EVALUATION FORM

North Divide

9/1/76

Item Rated	Stability Indicators by Classes				POOR
	EXCELLENT	GOOD	FAIR	POOR	
I. UPPER BANKS					
Landform Slope	(2) Bank slope gradient <30%. No evidence of past or potential for future mass wasting into channels.	(2) Bank slope gradient 30-40%. Infrequent and/or very small future potential.	(4) Bank slope gradient 40-60%. Moderate frequency & size, with some raw spots eroded by water during high flows.	(6) Bank slope gradient 60% +. Frequent or large, causing imminent danger of same.	8
Mass Wasting (Existing or Potential)	(2) Essentially absent from immediate channel area.	(2) Present but mostly small twigs and limbs.	(4) Present, volume and size are both increasing.	(6) Moderate to heavy amounts, predominantly larger sizes.	12
Debris Jam Potential (Floatable Objects)	(2) 90% + plant density. Vigor and variety suggests a deep, dense root mass.	(2) 70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass.	(4) 50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	(6) Species & less vigor indicate poor, discontinuous, and shallow root mass.	8
Bank Protection from Vegetation	(3) Species or lower vigor suggests a less dense or deep root mass.	(3) Species or lower vigor suggests a less dense or deep root mass.	(6) Species or lower vigor suggests a less dense or deep root mass.	(9) Species & less vigor indicate poor, discontinuous, and shallow root mass.	12
II. LOWER BANKS					
Channel Capacity	(1) Ample for present plus some increases. Peak flows contained. W/D ratio <7.	(1) Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8-15.	(2) Barely contains present floods. W/D ratio 15-25.	(3) Inadequate. Overbank flows common. W/D ratio >25.	4
Bank Rock Content	(2) 65% + with large, angular boulders 12" + numerous.	(2) 40 to 65%, mostly small. Boulders to cobble 6-12".	(4) 20 to 40%, with most in the 3-6" diameter class.	(6) <20% rock fragments of gravel sizes, 1-3" or less.	8
Obstructions Flow Deflectors Sediment Traps	(2) Rocks, old logs firmly embedded. Flow pattern of pool & riffles stable without cutting or deposition.	(2) Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors never and less firm.	(4) Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	(6) Frequent obstructions and deflectors cause bank erosion yearlong. Sed. traps full, channel migration occurring.	8
Cutting	(4) Little or none evident. Infrequent raw banks less than 6" high generally.	(4) Some, intermittently at outcrops & constrictions. Raw banks may be up to 12".	(8) Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident.	(9) Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16
Deposition	(4) Little or no enlargement of channel or point bars.	(4) Some new increases in bar formation, most from coarse gravels.	(8) Moderate deposition of new gravel & coarse sand on old and some new bars.	(10) Extensive deposits of predominately fine particles. Accelerated bar development.	16
III. BOTTOM					
Rock Angularity	(1) Sharp edges and corners, plane surfaces roughened.	(1) Rounded corners & edges, surfaces smooth & flat.	(2) Corners & edges well rounded in two dimensions.	(3) Well rounded in all dimensions, surfaces smooth.	4
Brightness	(1) Surfaces dull, darkened, or stained. Gen. not "bright".	(1) Mostly dull but may have up to 35% bright surfaces.	(2) Mixture, 50-50% dull and bright, ± 15%, ie 35-65%.	(3) Predominately bright, 65% +, exposed or scoured surfaces.	4
Consolidation or Particle Packing	(2) Assorted sizes tightly packed and/or overlapping.	(2) Moderately packed with some overlapping.	(4) With no apparent overlap.	(5) No packing evident. Loose assortment, easily moved.	8
Bottom Size Distribution & Percent Stable Materials	(4) No change in sizes evident. Stable materials 80-100%.	(4) Distribution shift slight. Stable materials 50-80%.	(8) Moderate change in sizes. Stable materials 20-50%.	(9) Marked distribution change. Stable materials 0-20%.	16
Scouring and Deposition	(6) Less than 5% of the bottom affected by scouring and deposition.	(6) Scour at constrictions and where grades steepen. Some deposition in pools.	(12) 30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	(14) More than 50% of the bottom in a state of flux or change nearly yearlong.	24
Clinging Aquatic Vegetation (Moss & Algae)	(1) Abundant. Growth largely moss like, dark green, perennial. In swift water too.	(1) Common. Algal forms in low velocity & pool areas. Moss here too and on after waters.	(2) Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	(3) Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4
COLUMN TOTALS	4	12	66	66	

Add the values in each column for a total reach score here. $(4 + 12 + 66 + 12 = 94)$.

Reach score of: (38-Excellent, 39-76-Good, 77-114-Fair, 115-Poor).

RI-2500-5 (6

usda-forest service

Table 29 R-1 STREAM CHANNEL STABILITY FIELD EVALUATION FORM

South Divide
9/1/76

Item Rated	Stability Indicators by Classes					
	EXCELLENT		GOOD		FAIR	
I. UPPER BANKS	Landform Slope	Bank slope gradient <30%	(2) Bank slope gradient 30-40%	(4) Bank slope gradient 40-60%	(6) Bank slope gradient 60%+	POOR
	Mass Wasting (Existing or Potential)	No evidence of past or potential for future mass wasting into channels.	(3) Mostly healed over, low future potential.	(4) With some raw spots eroded by water during high flows.	(9) Frequent or large, causing imminent danger of same.	8
	Debris Jam Potential (Floatable Objects)	Essentially absent from immediate channel area.	(2) Present but mostly small twigs and limbs.	(4) Present, volume and size are both increasing.	(5) Moderate to heavy amounts, predominantly larger sizes.	1/2
	Bank Protection from Vegetation	90%+ plant density. Vigor and variety suggests a deep, dense root mass.	(3) Species or lower vigor suggests a less dense or deep root mass.	(6) form a somewhat shallow and discontinuous root mass.	(9) species & less vigor indicate poor, discontinuous, and shallow root mass.	8
	LOWER BANKS					1/2
II. CHANNEL CAPACITY	Channel Capacity	Ample for present plus some increases. Peak flows contained, W/D ratio <7.	(1) Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8-15.	(2) Barely contains present peaks. Occasional overbank floods, W/D ratio 15-25.	(3) Inadequate. Overbank flows common. W/D ratio >25.	4
	Bank Rock Content	65%+ with large, angular boulders 12" + numerous.	(2) 40 to 65%, mostly small boulders to cobble 6-12".	(4) 20 to 40%, with most in the 3-6" diameter class.	(5) <20% rock fragments of gravel sizes, 1-3" or less.	8
	Obstructions	Rocks, old logs firmly embedded. Flow pattern of pool & riffles stable without cutting or deposition.	(2) Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors never and less firm.	(4) Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	(6) Frequent obstructions and deflectors cause bank erosion yearlong. Sed. traps full, channel migration occurring.	8
	Cutting	Little or none evident. Infrequent raw banks less than 6" high generally.	(4) Some, intermittently at outcrops & constrictions. Raw banks may be up to 12".	(8) Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident.	(12) Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	1/6
	Deposition	Little or no enlargement of channel or point bars.	(4) Some new increases in bar formation, most from coarse gravels.	(7) Moderate deposition of new gravel & coarse sand on old and some new bars.	(12) Extensive deposits of predominantly fine particles. Accelerated bar development.	1/6
III. BOTTOM	Rock Angularity	Sharp edges and corners, plane surfaces roughened.	(1) Rounded corners & edges, surfaces smooth & flat.	(2) Corners & edges well rounded in two dimensions.	(3) Well rounded in all dimensions, surfaces smooth.	4
	Brightness	Surfaces dull, darkened, or stained. Gen. not "bright".	(1) Mostly dull but may have up to 35% bright surfaces.	(2) Mixture, 50-50% dull and bright, ± 15%, ie 35-65%.	(3) Predominately bright, 65%+, exposed or scoured surfaces.	4
	Consolidation or Particle Packing	Assorted sizes tightly packed and/or overlapping.	(2) Moderately packed with some overlapping.	(4) Mostly a loose assortment with no apparent overlap.	(6) No packing evident. Loose assortment, easily moved.	8
	Bottom Size Distribution	No change in sizes evident.	(4) Distribution shift slight.	(8) Moderate change in sizes.	(12) Marked distribution change.	1/6
	6 Percent Stable Materials	Stable materials 80-100%.	(4) Stable materials 50-80%.	(8) Stable materials 20-50%.	(12) Stable materials 0-20%.	1/6
Scouring and Deposition	Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition.	(6) 5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	(12) 30-50% affected. Deposits & scour at obstructions, constrictions, and bends.	(18) More than 50% of the bottom in a state of flux or change nearly yearlong.	24
	Clinging Aquatic Vegetation (Moss & Algae)	Abundant. Growth largely moss like, dark green, perennial. In swift water too.	(1) Common. Algal forms in low velocity & pool areas. Moss here too and swifter waters.	(2) Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	(3) Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4
	Column Totals	2	99	72	31	100
	Add the values in each column for a total reach score here. (E. 2 + G. 99 + F. 22 + P. 3 = 72).					
	Reach score of: (38=Excellent, 39-76=Good, 77-114=Fair, 115=Poor).					

Reach score of: (38=Excellent, 39-76=Good, 77-114=Fair, 115=Poor).

RI-2500-5 (6)

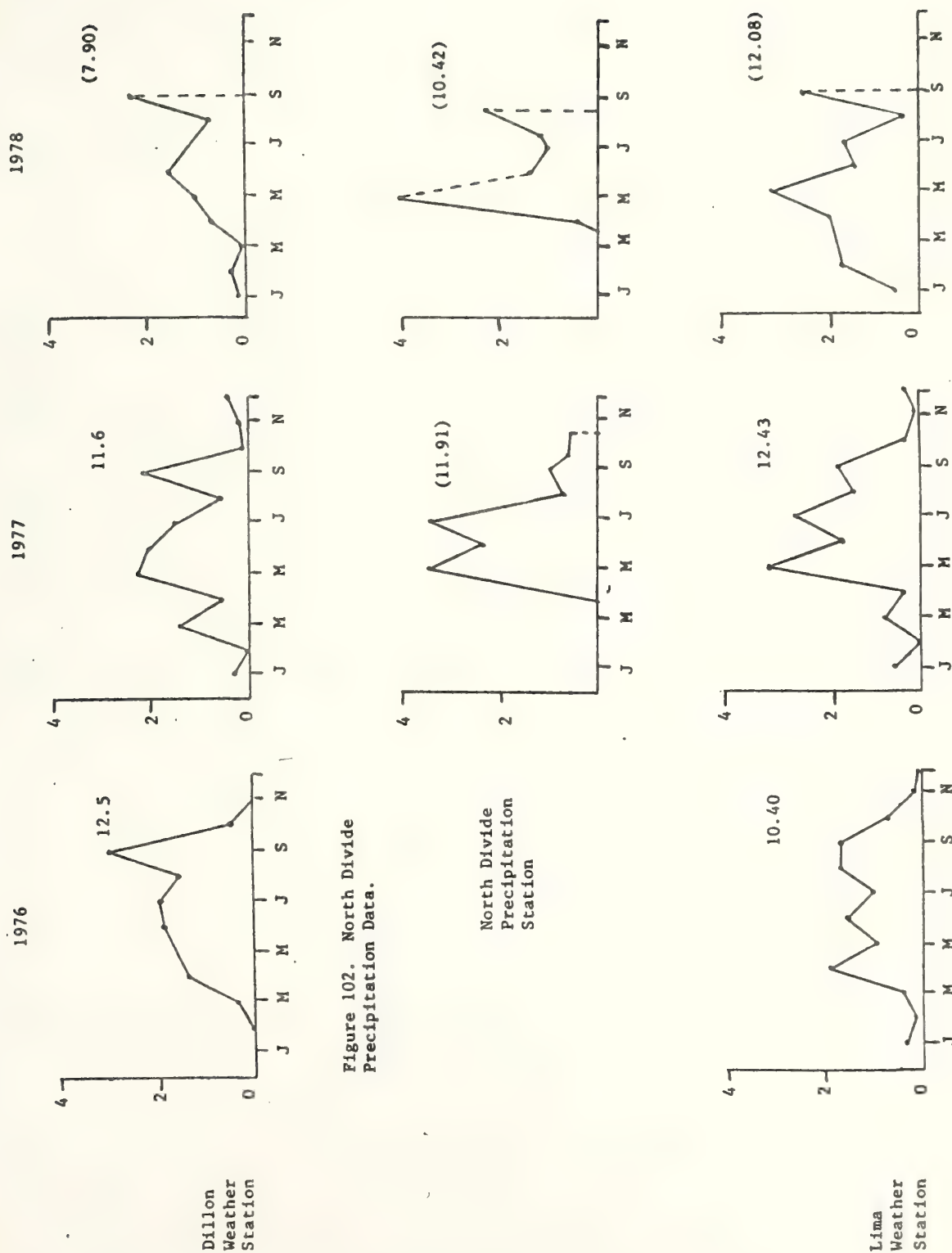
Precipitation

Precipitation was measured at the North Divide precipitation station from April 23 through November 11, 1977 and from April 20 through September 13, 1978. The general precipitation patterns during these two fiscal years are compared to those of the Dillon and Lima weather stations (Figure 102). While both years indicate high precipitation for May, the high July peak is absent in 1978 at the North Divide station.

Stream Discharge

The staff-discharge rating curves for the North Divide and South Divide sampling stations are presented in Figures 103 and 104. The gauging sites remained stable during the two sampling years. Channel bed conditions at the South Divide station created a threshold at low flow values.

The 1977 and 1978 annual hydrographs for the North Divide and South Divide sampling stations are presented in Figures 105-108. Two early peak flows of 4.0 cfs and 4.2 cfs were noted for North Divide in late April and late May. An earlier peak may have occurred prior to initial sampling. The annual peak of 5.4 cfs occurred in late July subsequent to an intense period of precipitation. The lowest recorded flow during 1977 was only 0.23 cfs during late September. The 1978 year produced an early peak flow of 5.7 cfs in late May which preceeded the seasonal peak discharge of approximately 8.4 cfs in mid-June. The lowest recorded flow for 1978 was 0.26 cfs during the previous October. The South Divide station exhibited similar patterns. An estimated peak discharge of 3.0 cfs was noted in late June, 1977, with the annual peak of 3.8 cfs occurring in late July. The lowest recorded flow for the year was 1.0 cfs in mid-September. During 1978, however, an annual peak flow of 12 cfs was indicated for mid-June, while the lowest flow was



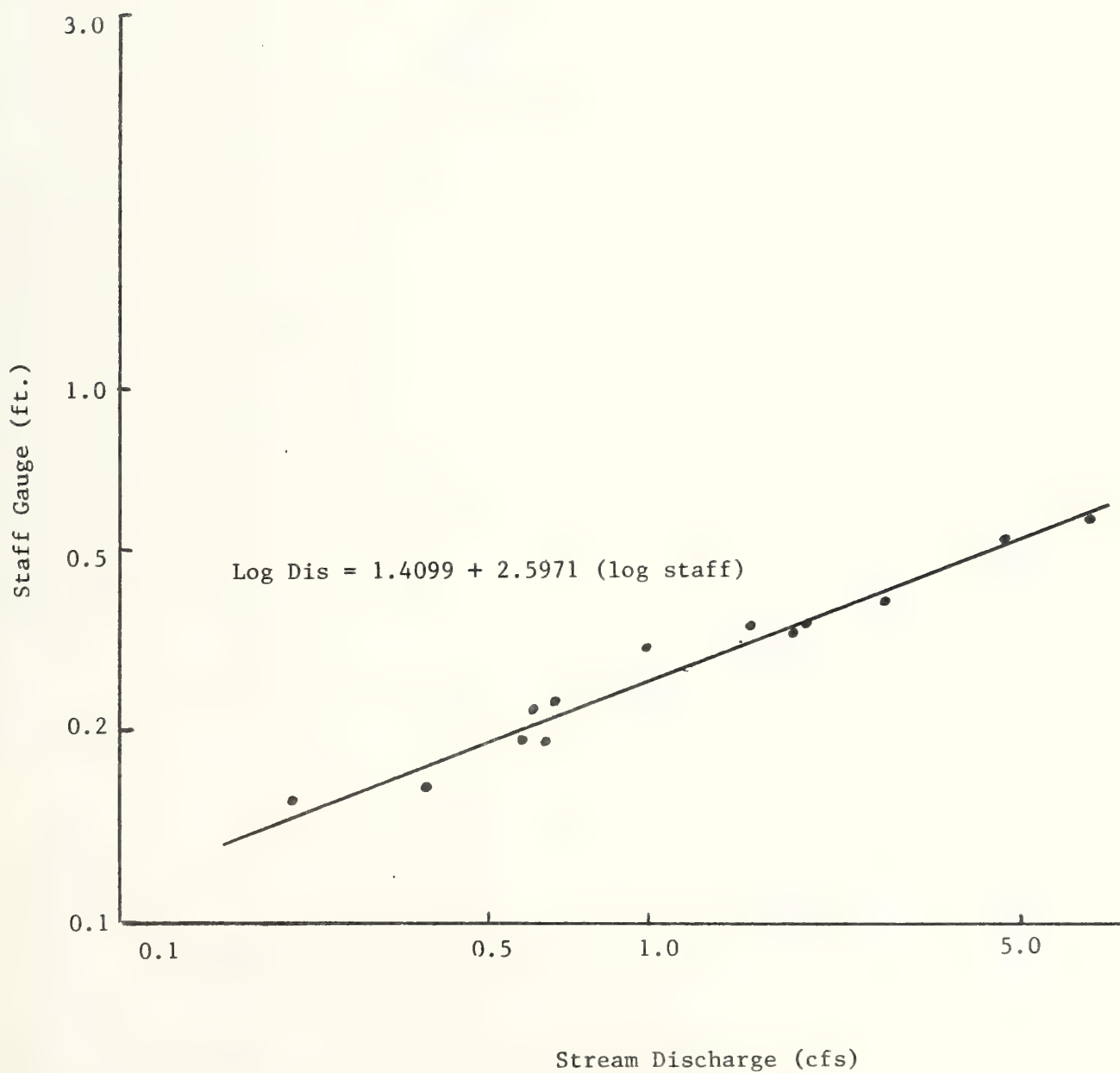


Figure 103. Staff-discharge Rating Curve for the North Divide Station.

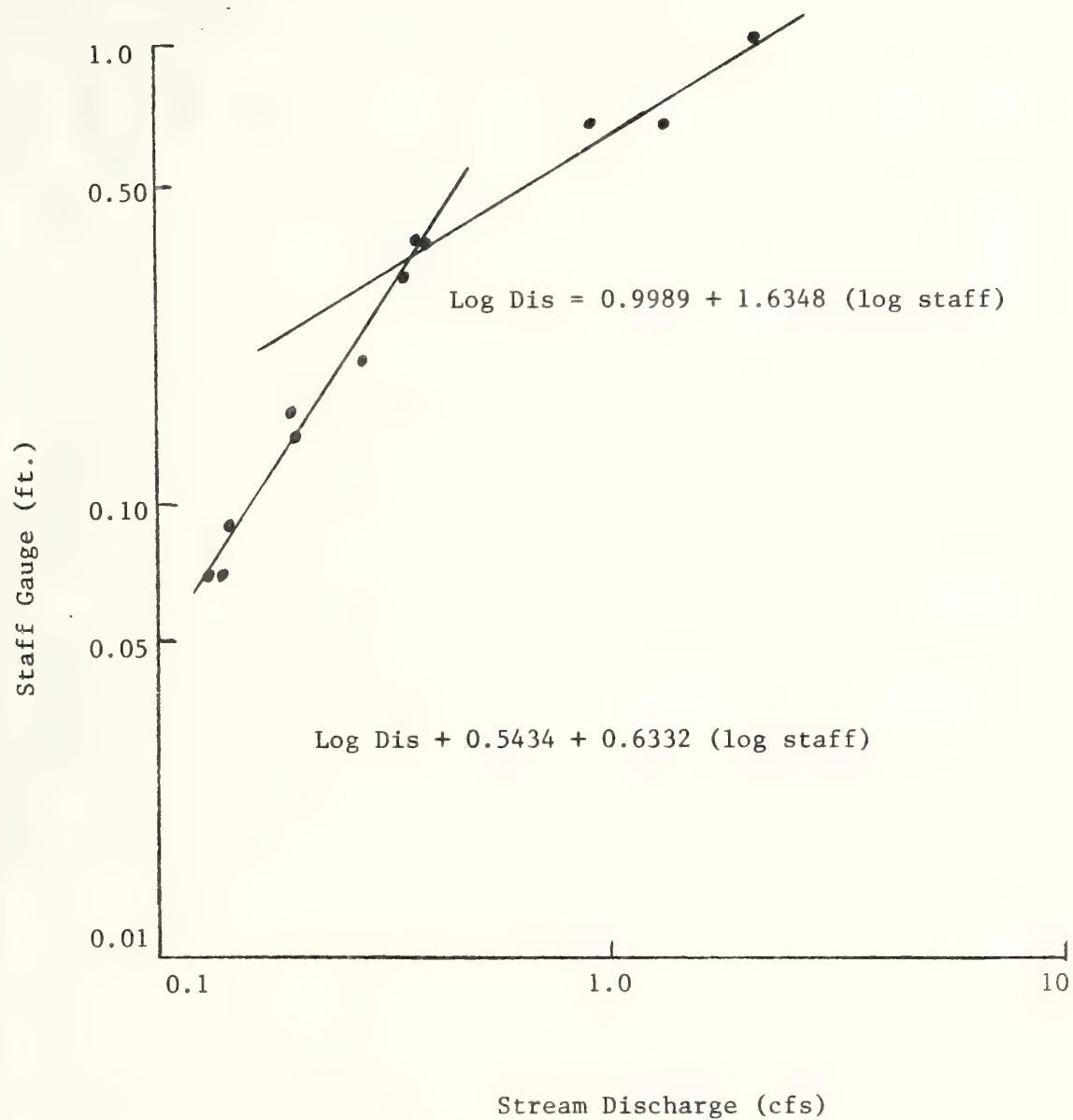


Figure 104. Staff-discharge Rating Curve for the South Divide Station.

FIGURE 105. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
NORTH DIVIDE - 1977

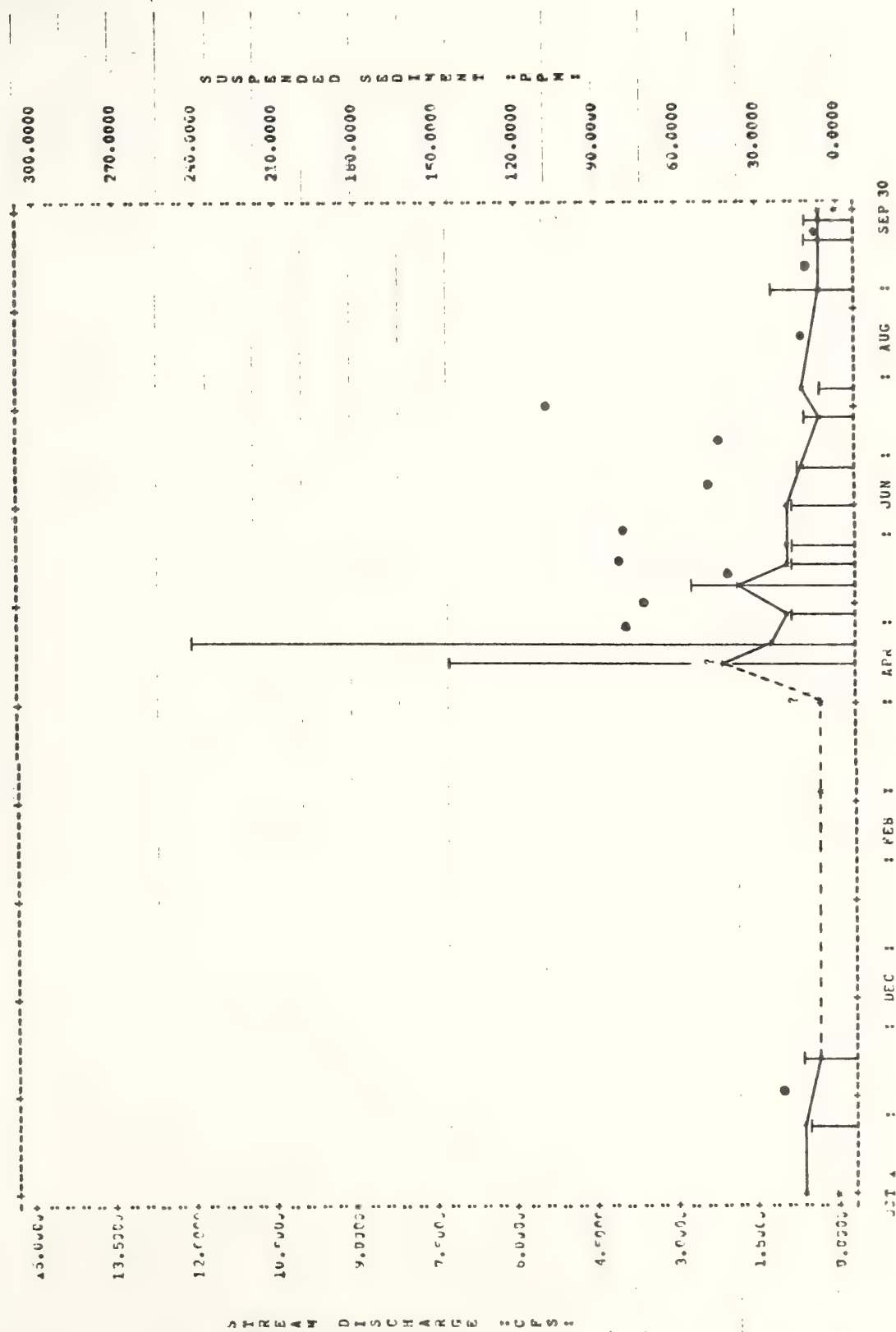


FIGURE 106. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
NORTH DIVIDE - 1978

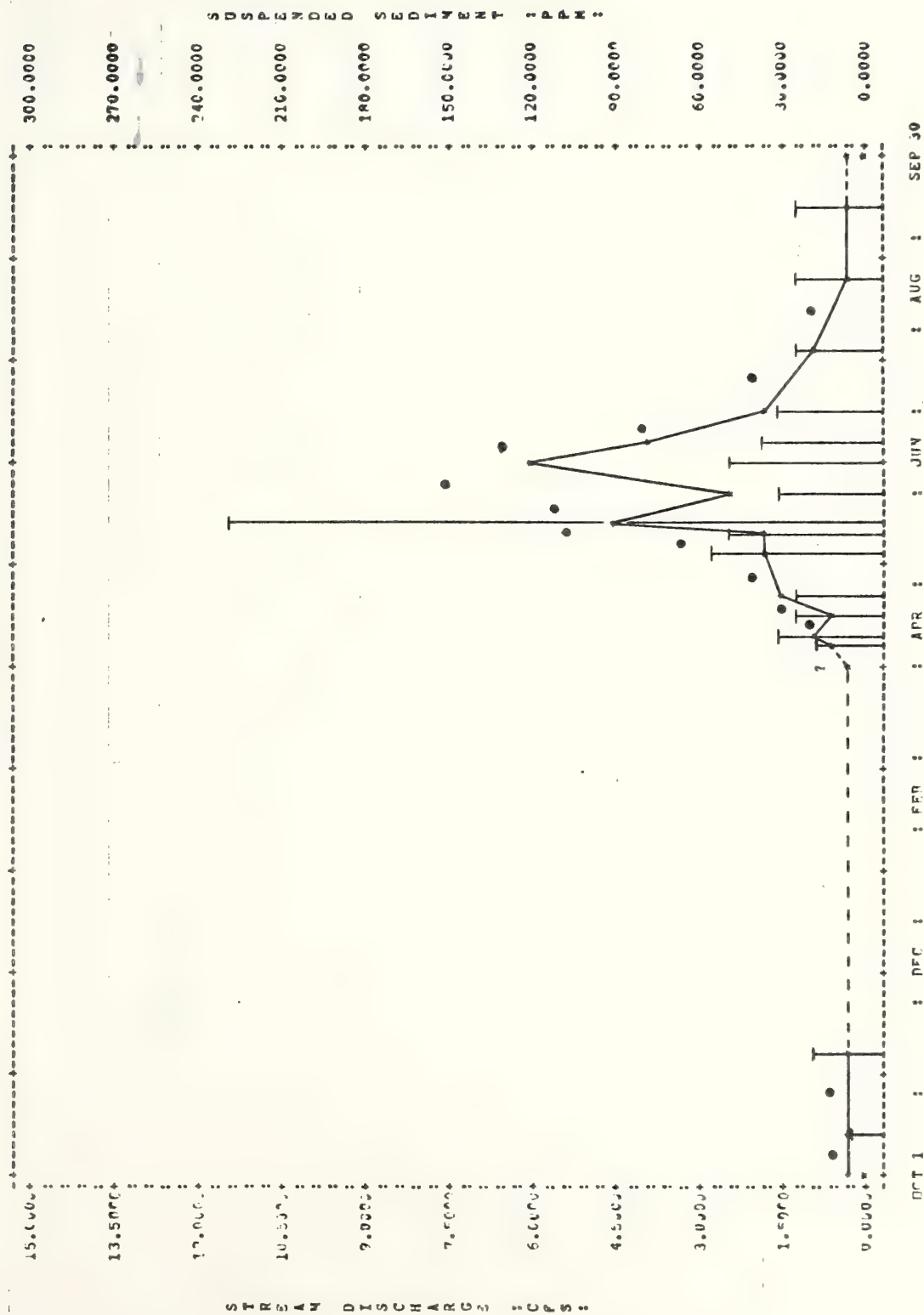


FIGURE 107. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
SOUTH DIVIDE - 1977

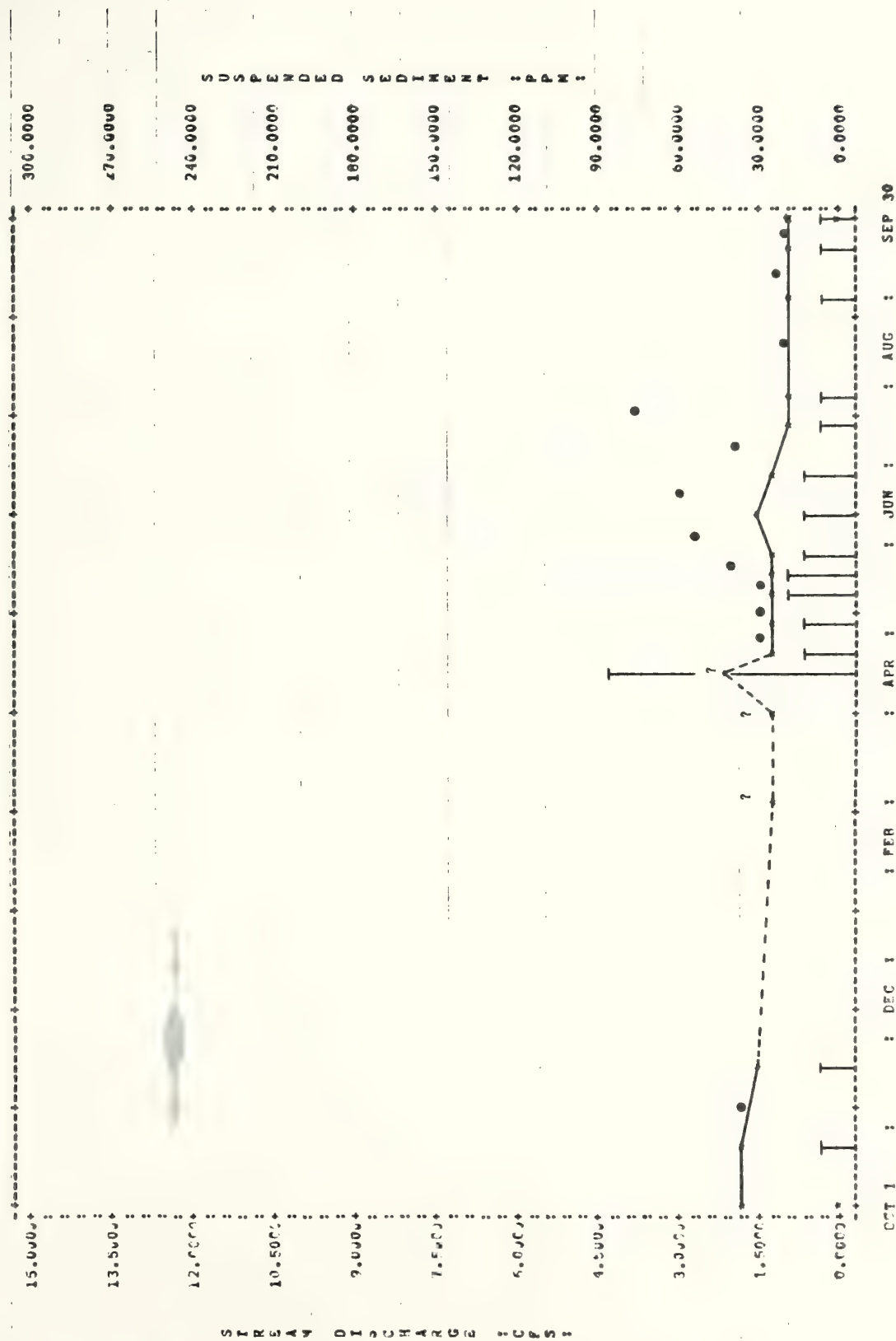
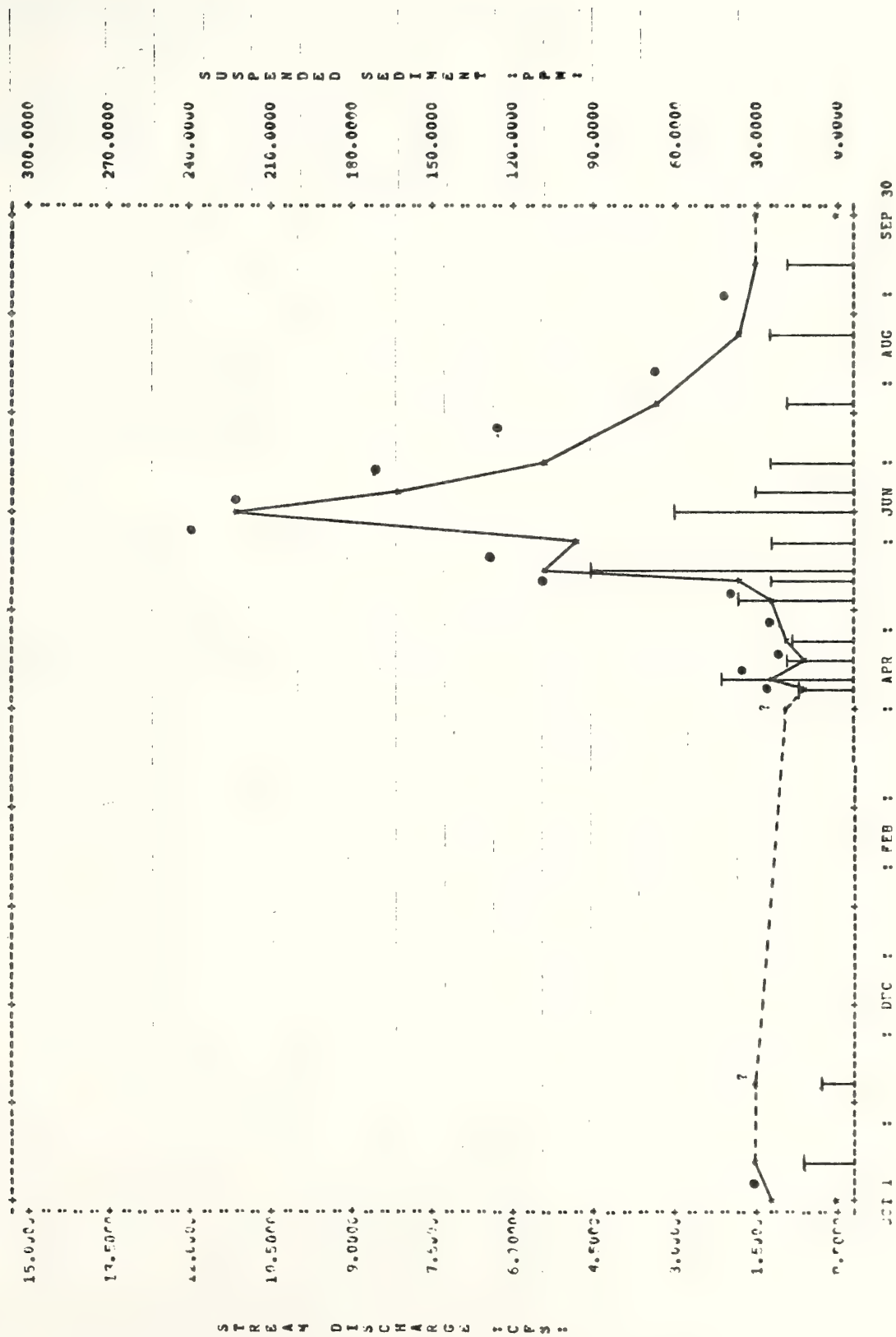


FIGURE 108. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
SOUTH DIVIDE - 1978



recorded at 0.69 cfs in mid-April. The differences noted in flow patterns for the two hydrologic years are largely attributed to differences in the annual precipitation and snow melt patterns.

The respective annual hydrograph data were used to estimate the annual water yields for each station (Table 30). In both water years, the estimated yield for the South Divide station was 2.3 fold that of the North Divide station. These values approximated 946 acre feet and 410 acre feet for 1977, which increased to 1600 acre feet and 695 acre feet for 1978. A 70 percent increase in water yield was noted for 1978 at each station.

Suspended Sediment

The annual patterns of sediment concentrations for each station by hydrologic year are depicted in Figures 105-108. Suspended sediment concentrations at the North Divide station ranged from 6 ppm to 243 ppm, while those for the South Divide station ranged from <5 ppm to 92 ppm. The relationships between suspended sediment and stream discharge for each station were statistically significant, and are presented in Figures 109 and 110. The variability in sediment concentration with stream flow is partially attributed to a seasonal effect, specific storm effects, and to the hysteresis effect, whereby peak concentrations of suspended sediment generally occur prior to peak runoff during the rising stage (Gregory and Walling, 1973, pp. 215-219). Annual sediment yields for the two sample stations were estimated from respective water yield and sediment concentration data (Table 30). The North and South Divide stations produced approximately 24 tons and 16 tons of suspended sediment respectively during 1977. These yields were increased to 49 tons and 60 tons for the more active 1978 hydrologic year. Sediment yield for North Divide doubled over the two

Table 30. Estimated Water and Sediment Yields for Divide Creek, 1977 - 1978.

Station Name	Water Year	Estimated Water Yield (ac. - ft.)	Estimated Sediment Yield (tons)	Contributing Watershed (acres)	Runoff (in./ac.)	Sediment Yield (lbs/acre)
North Divide Station	1977	410	24	1,600	3.07	30.4
	1978	695	49	1,600	5.21	61.0
South Divide Station	1977	946	16	1,980	5.73	16.6
	1978	1,600	60	1,980	9.70	61.0

FIGURE 109. SUSPENDED SEDIMENT VS STREAM DISCHARGE - NORTH DIVIDE

LOG SED = 1.4642 + 0.6507(LOG DIS)

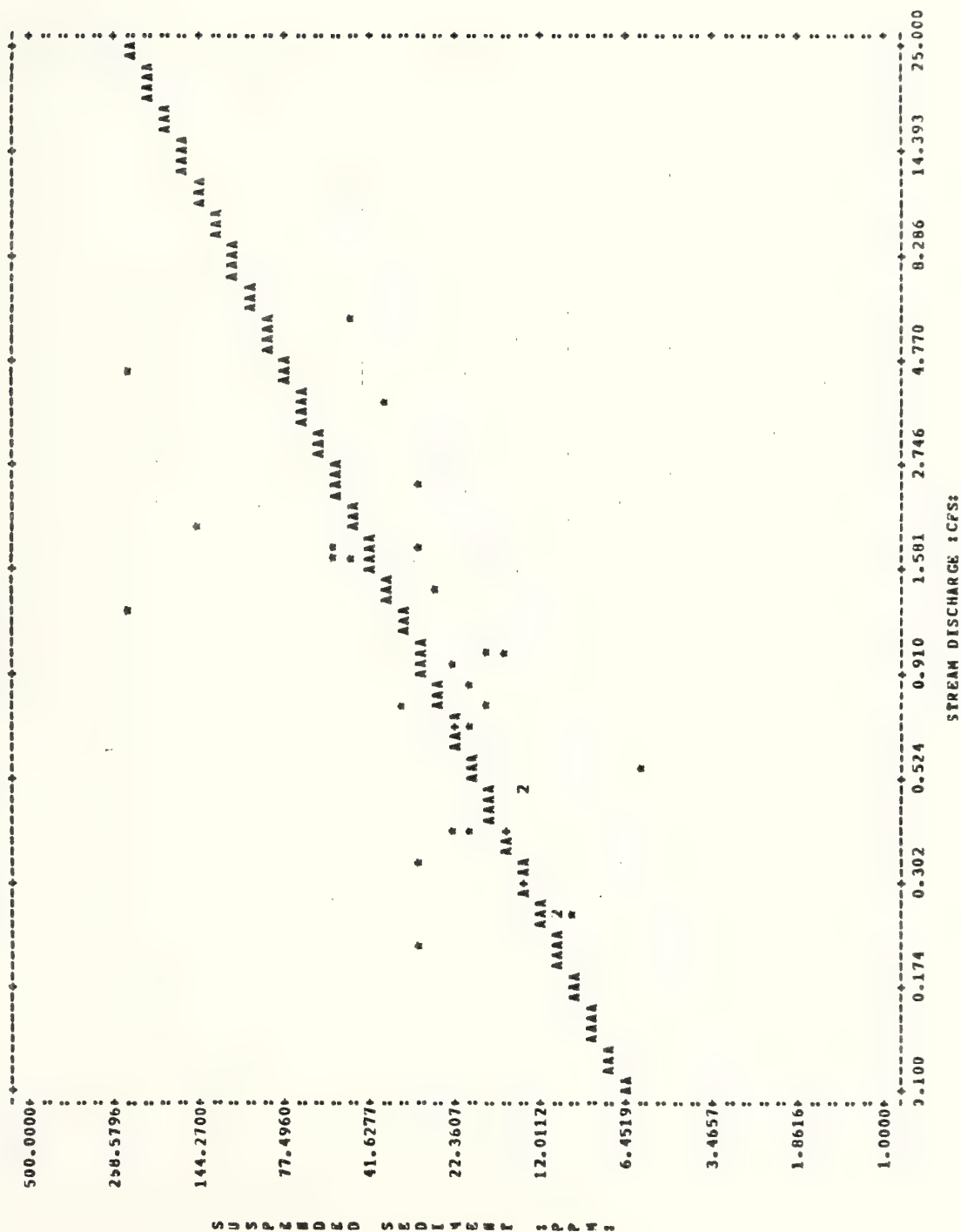
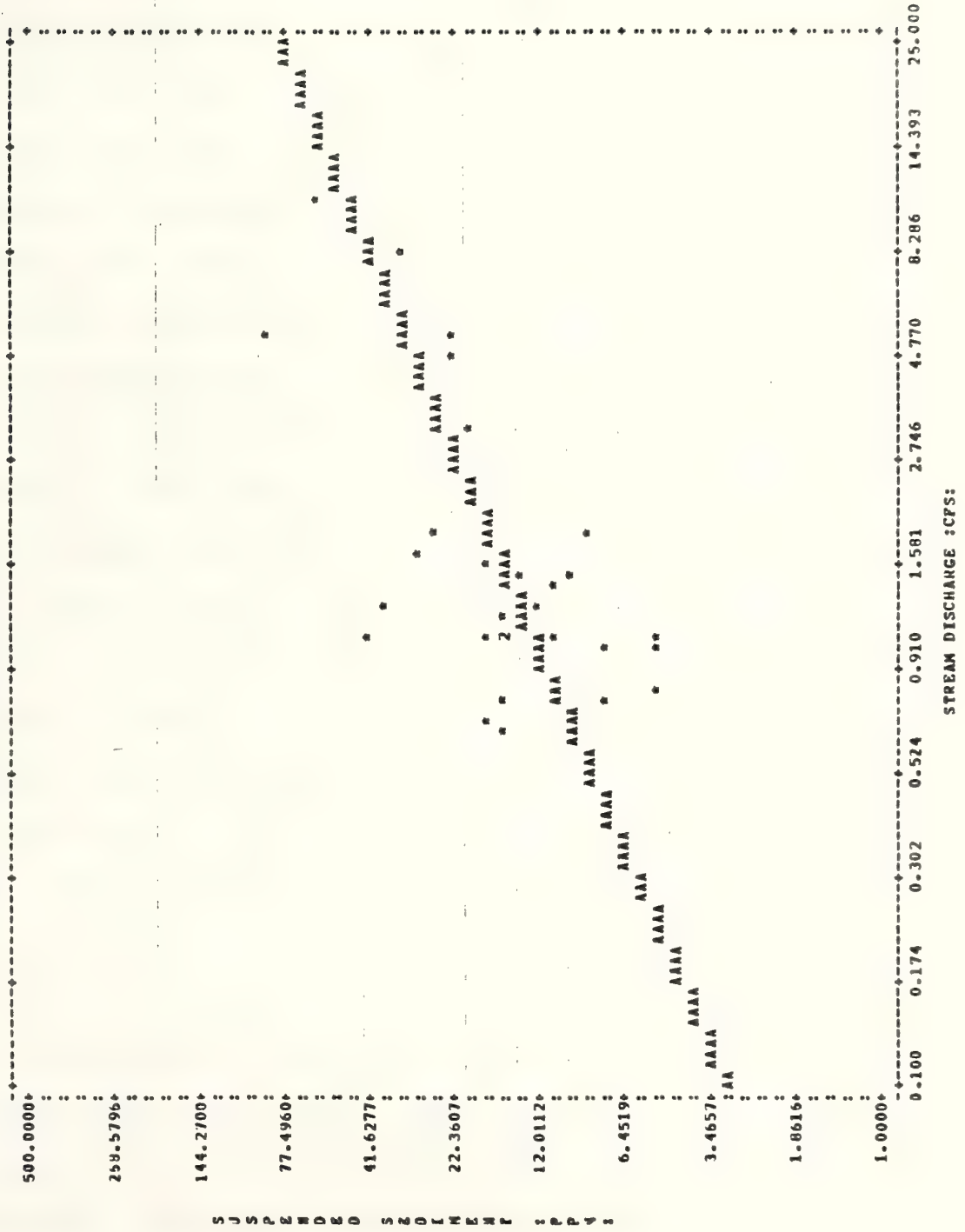


FIGURE 110. SUSPENDED SEDIMENT VS STREAM DISCHARGE - SOUTH DIVIDE

LOC SED = 1.0775 + 0.5911(LOC DIS)



sample years, while South Divide data indicates a four fold increase.

Hydrochemical Parameters

The concentration of dissolved solids is inversely related to stream discharge so that lower concentrations occur during periods of high runoff, while higher concentrations are found during periods of low summer base flow (Gunnerson, 1967; Gregory and Walling, 1973, pp. 219-225). Patterns for specific ions, especially the ecologically important ones, often vary from this generalization (Likens, et al., 1977, pp. 74-76).

Specific conductance for the North Divide station ranged from a low of 27 μ mhos during high spring runoff to a high of 51 μ mhos during summer base flow. The South Divide station exhibited a similar pattern, values ranging from 35 μ mhos to a high of 68 μ mhos. The relationships between specific conductance and stream discharge for each station were statistically significant and are presented in Figures 111 and 112. Variation in specific conductance with stream discharge is partially attributed to seasonal and storm hysteresis effects (Gregory and Walling, 1973, pp. 219-225). The ranges in ionic concentration for specific ions are presented in Table 31.

Bacterial Levels

The concentration of fecal and total coliform in streams draining rangeland watersheds is directly related to the number of cattle present, their access to the stream, the physical and hydrological characteristics of the basin, local weather conditions (Kunkle, 1970; Stephensen and Street, 1978), and the time of day (Kunkle and Meiman, 1968). Seasonal patterns include a spring "flushing" effect during the rising stage (Kunkle and Meiman, 1968), with high counts during the low flow summer period, counts which often continue for some period after the cattle have been removed

FIGURE 111. CONDUCTIVITY VS STREAM DISCHARGE - NORTH DIVIDE

LOG COND = 1.5865 - 0.1551(LOG DIS)



FIGURE 112. CONDUCTIVITY VS STREAM DISCHARGE - SOUTH DIVIDE
LOG COND = 1.761 - 0.1644(LOG DIS)

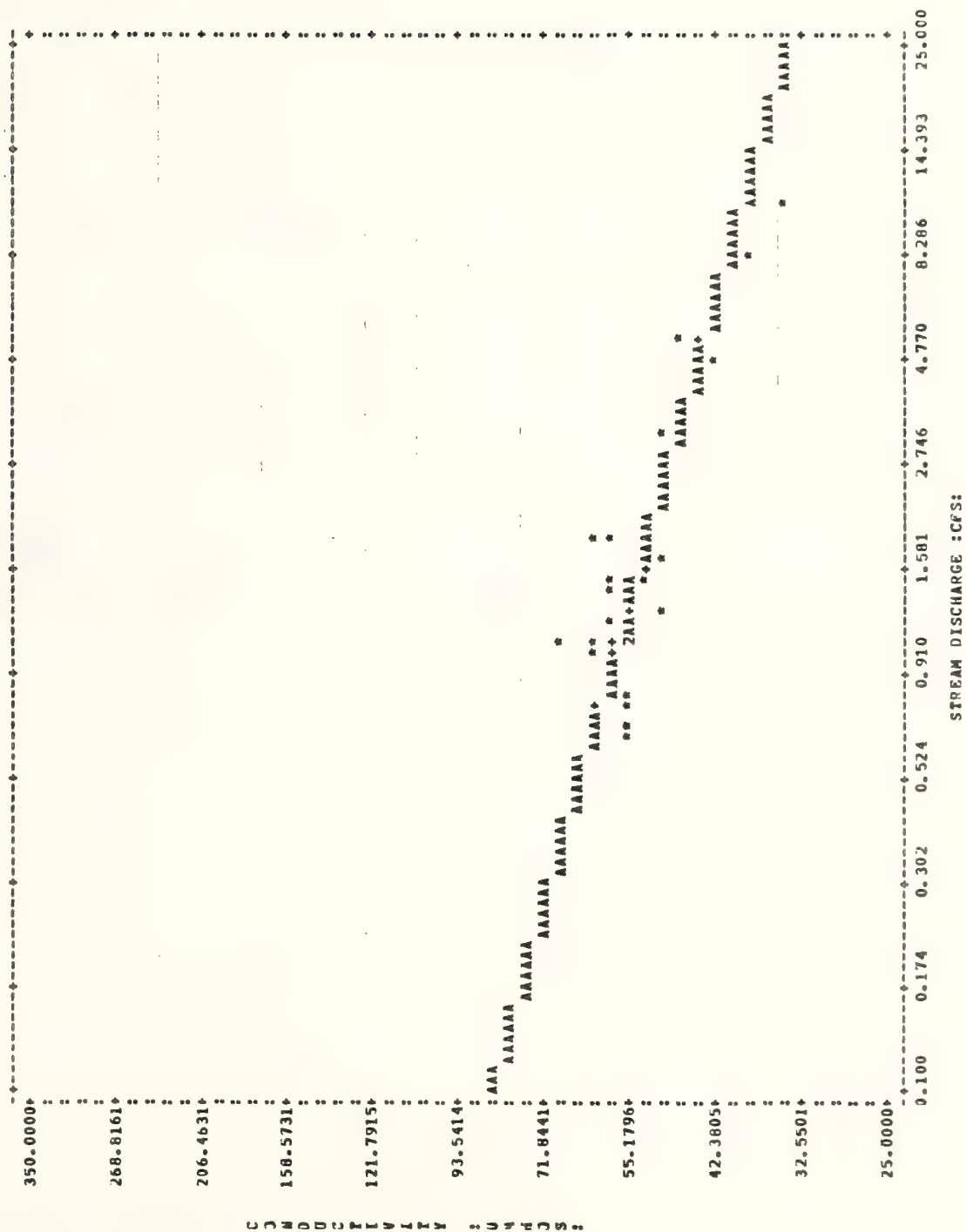


Table 31. Ranges of Hydrochemical Characteristics of the Divide Watershed Sampling Stations, 1977 - 1978.

	North Divide	South Divide
pH	6.00 - 7.42	6.40 - 7.53
Alkalinity (CaCO_3) (mg/l)	13 - 23	18 - 43
Specific Conductance (μmhos)	27 - 51	35 - 68
Total Dissolved Solids (mg/l)	18 - 33	23 - 44
Ca (mg/l)	2.5 - 6.3	6.5 - 11
Mg (mg/l)	0.93 - 1.7	1.4 - 2.0
Na (mg/l)	1.5 - 2.7	1.0 - 2.5
K (mg/l)	0.52 - 1.6	0.27 - 1.7
HCO_3 (mg/l)	15 - 28	22 - 52
SO_4 (mg/l)	2 - 4	1 - 4
NH_4 (mg/l)	< 0.01 - 0.22	< 0.01 - 0.09
$\text{NO}_3 + \text{NO}_2 - \text{N}$ (mg/l)	< 0.01 - 0.13	< 0.01 - 0.39
PO_4 (Ortho) -P (mg/l)	0.034 - 0.092	0.021 - 0.069

from the area (Stephensen and Street, 1978). This seasonal pattern may briefly be modified by local storms which produce their own "flushing" effect, and which may or may not be followed by a short term dilution period.

The concentrations of fecal coliform for the North and South Divide sampling stations for the study period are presented in Table 32. Higher values occurred during and following the grazing season. High fecal coliform levels are indicated for South Divide, although cattle were not in evidence in the vicinity of the station site. Maximum fecal coliform levels were >1500 and >1500 colonies/100 mls respectively for each station. Approximately 69 percent and 62 percent of the sample coliform counts exceeded the 200 colony/100 ml limit of the Montana Water Quality Criteria. A spring "flush" may be in evidence at both stations during the 1978 sample year.

Comments

Although water yields increased 2.3 fold from 1977 to 1978 for both Divide sampling stations, sediment yields increased two fold and four fold for the North and South stations respectively. The effect of a timer harvesting operation in the Divide Creek basin upon the respective sediment yields is not known. Both North and South Divide Creeks had elevated fecal coliform levels for over 60 percent of the sampling visits. Because of the limited number of samples taken and the nature of the hydrochemical parameters evaluated, however, specific relationships between the water quality characteristics of Divide Creek and the Montana Water Quality criteria cannot be addressed.

Table 32. Fecal Coliform Counts (colonies/100 mls) for the Divide Watershed Sampling Stations, 1977 - 1978.

	North Divide		South Divide	
	1977	1978	1977	1978
April		10		145
May	7	264	10	87
June	TNTC(?)	20	TNTC(?)	65*
July	810*	1390(?)	820(?)	115(?)
August	1540*	267(?)	330(?)	1500(?)
September	859*	1060*	425(?)	417(?)
October	125		510	
November	373		970	

* Stock visually present.

(?) Stock presence uncertain.

Jeff Davis Creek Basin

The Jeff Davis Creek sampling basin was visited a total of 16 and 19 times during the two hydrologic years. There were no specific accessibility or sampling problems. The Upper Jeff Davis station was monitored 15 and 17 times respectively

Channel Stability Ratings

Jeff Davis Creek was evaluated on September 2, 1976. The segment from the Bannock Pass road to one half mile above the Beaverhead National Forest boundary was rated as 'good' (65) (Table 33).

Precipitation

Precipitation was measured at the Upper Jeff Davis precipitation station from April 23 through November 11, 1977 and from April 6 through September 13, 1978. The general precipitation patterns during these two fiscal years are compared to those of the Dillon and Lima weather stations (Figure 113). Although the 1977 data indicate high precipitation for May and July, more total precipitation fell during the 1978 field season.

Stream Discharge

The staff-discharge rating curves for the Lower Jeff Davis and Upper Jeff Davis sampling stations are presented in Figures 114 and 115. The gauging sites remained stable during the two sampling years, except for some minor channel erosion at the Lower station.

The 1977 and 1978 annual hydrographs for the Lower Jeff Davis and Upper Jeff Davis Creek sampling stations are presented in Figures 116-119. Peak flow during 1977 at the Lower station apparently occurred in early June at

Upper-Power Review

Table 33

R-1 STREAM CHANNEL STABILITY FIELD EVALUATION FORM

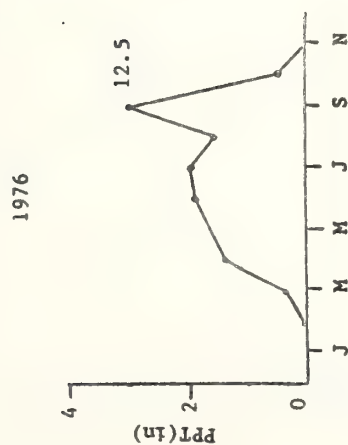
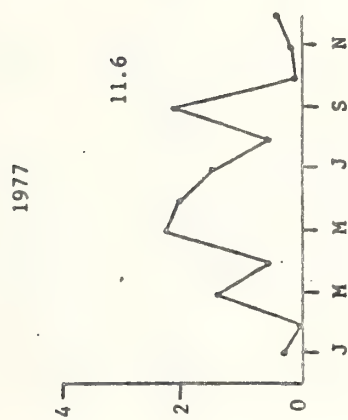
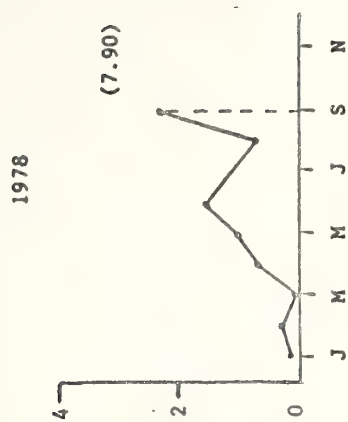
Jeff Davis
9/2/76

Item Rated	Stability Indicators by Classes			
	EXCELLENT	GOOD	FAIR	POOR
I. UPPER BANKS				
Bank Slope	Bank slope gradient 60% or less. No evidence of past or potential for future mass wasting into channels.	Bank slope gradient 30-40%. Infrequent and/or very small future potential.	Bank slope gradient 40-60%. Moderate frequency & size, by water during high flows.	Bank slope gradient 60% or more. Frequent or large, causing imminent danger of same.
Mass Wasting (Existing or Potential)	Essentially absent from immediate channel area.	(2) Present but mostly small twigs and limbs.	(3) Present, volume and size are both increasing.	(6) Moderate to heavy amounts, predominantly larger sizes.
Bank Protection	90% + plant density. Vigor and variety suggests a deep, dense root mass.	(3) 70-90% density. Fewer plant species or lower vigor suggests a less dense or deep root mass.	(5) 50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	(9) Species & less vigor indicate poor, discontinuous, and shallow root mass.
Vegetation				
II. LOWER BANKS				
Channel Capacity	Ample for present plus some increases. Peak flows contained. W/D ratio 47.	(1) Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8-15.	(3) Barely contains present peaks. Occasional overbank floods. W/D ratio 15-25.	(6) Inadequate. Overbank flows common. W/D ratio >25.
Bank Rock Content	65% + with large, angular boulders 12" + numerous.	(2) 40 to 65%, mostly small boulders to cobble 6-12".	(5) 20 to 40%, with most in the 3-6" diameter class.	(8) <20% rock fragments of gravel sizes, 1-3" or less.
Obstructions	Rocks, old logs firmly embedded. Flow pattern of pool & riffles stable without cutting or deposition.	(2) Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm.	(5) Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	(8) Frequent obstructions and deflectors cause bank erosion yearlong. Sed. traps full, channel migration occurring.
Cutting	Little or none evident. Infrequent raw banks less than 6" high generally.	(4) Outcrops & constrictions. Raw banks may be up to 12".	(7) Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident.	(12) Almost continuous cuts, some over 24" high. Failure of overhangs frequent.
Deposition	Little or no enlargement of channel or point bars.	(4) Some new increases in bar formation, most from coarse gravels.	(7) Moderate deposition of new gravel & coarse sand on old and some new bars.	(12) Extensive deposits of predominately fine particles. Accelerated bar development.
III. BOTTOM				
Rock Angularity	Sharp edges and corners. Plane surfaces roughened.	(1) Rounded corners & edges. Surfaces smooth & flat.	(3) Corners & edges well rounded in two dimensions.	(6) Well rounded in all dimensions, surfaces smooth.
Brightness	Surfaces dull, darkened, or stained. Gen. not "bright".	(1) Mostly dull but may have up to 35% bright surfaces.	(2) Mixture, 50-50% dull and bright, ± 15%, ie 35-65%.	(3) Predominately bright, 65% or more exposed or scoured surfaces.
Consolidation or Particle Packing	Assorted sizes tightly packed and/or overlapping.	(2) Moderately packed with some overlapping.	(4) Mostly a loose assortment with no apparent overlap.	(6) No packing evident. Loose assortment, easily moved.
Bottom Size Distribution	No change in sizes evident. Stable materials 80-100%.	(4) Distribution shift slight. Stable materials 50-80%.	(5) Moderate change in sizes. Stable materials 20-50%.	(12) Marked distribution change. Stable materials 0-20%.
Scouring and Deposition	Less than 5% of the bottom affected by scouring and deposition.	(6) 5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	(12) 30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	(18) More than 50% of the bottom in a state of flux or change nearly yearlong.
Clinging Aquatic Vegetation (Moss & Algae)	Abundant. Growth largely moss like, dark green, perennial. In swift water too.	(1) Common. Algal forms in low velocity & pool areas. Moss here too and swift water.	(2) Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	(3) Perennial types scarce or absent. Yellow-green, short term bloom may be present.
COLUMN TOTALS				6

Add the values in each column for a total reach score here. (E. = 0.59 + P. 6 + P. = 65).

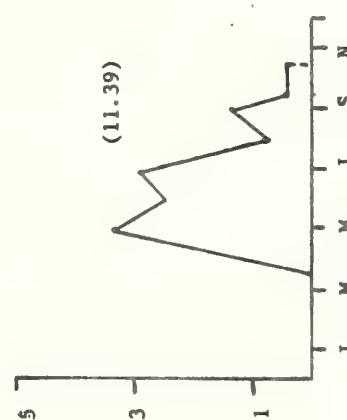
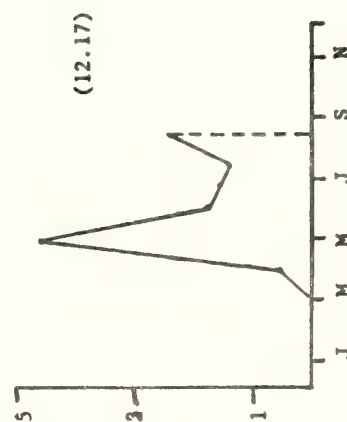
Reach score of: <38-Excellent, 39-76-Good, 77-114-Fair, 115-Poor.

RI-2500-5 (6)

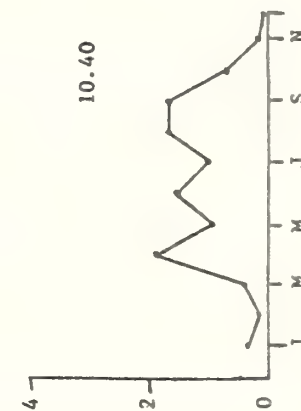
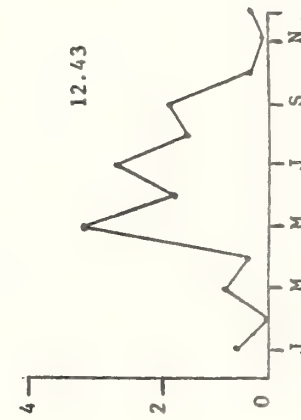
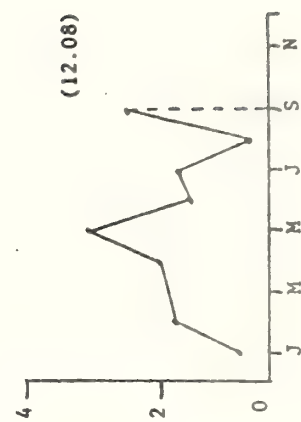


Dillon
Weather
Station

Figure 113. Upper Jeff Davis
Precipitation Data.



Upper Jeff Davis
Precipitation
Station



Lima
Weather
Station

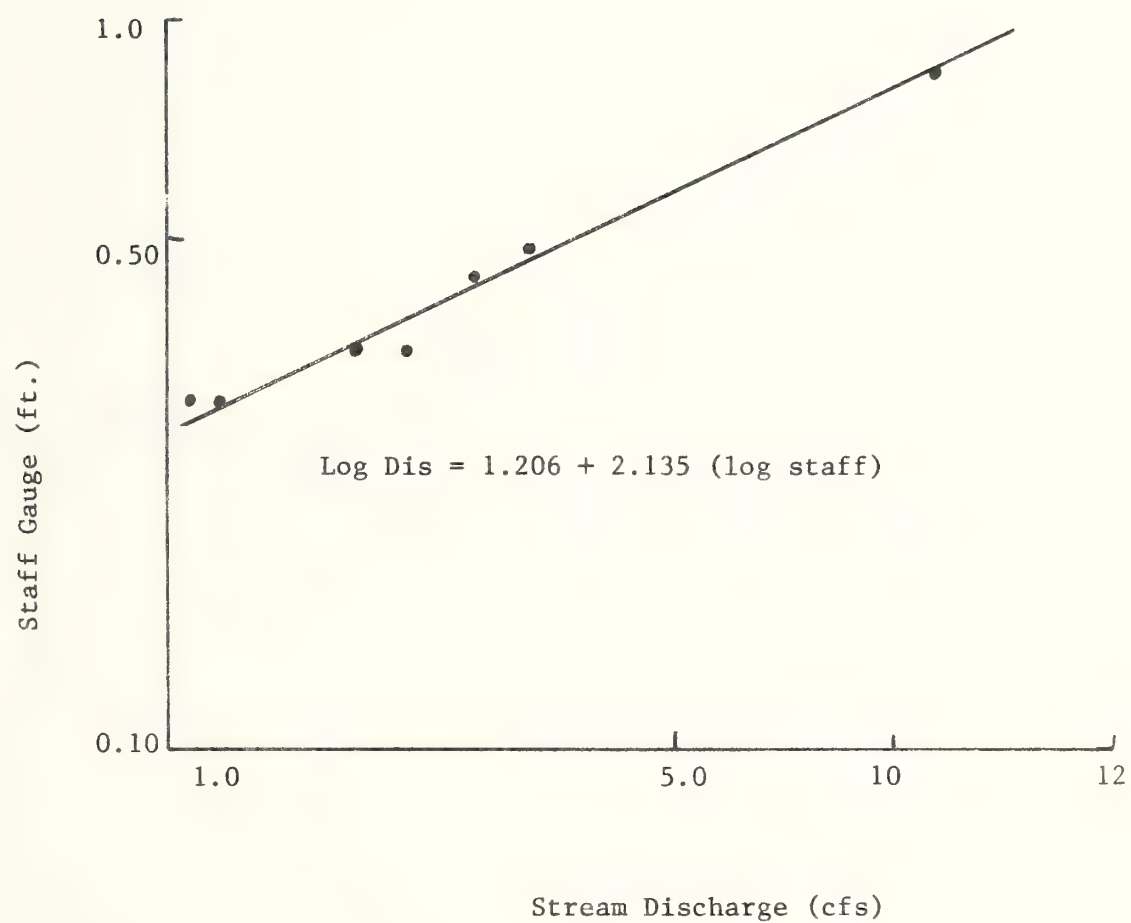


Figure 114. Staff-discharge Rating Curve for the Lower Jeff Davis Station.

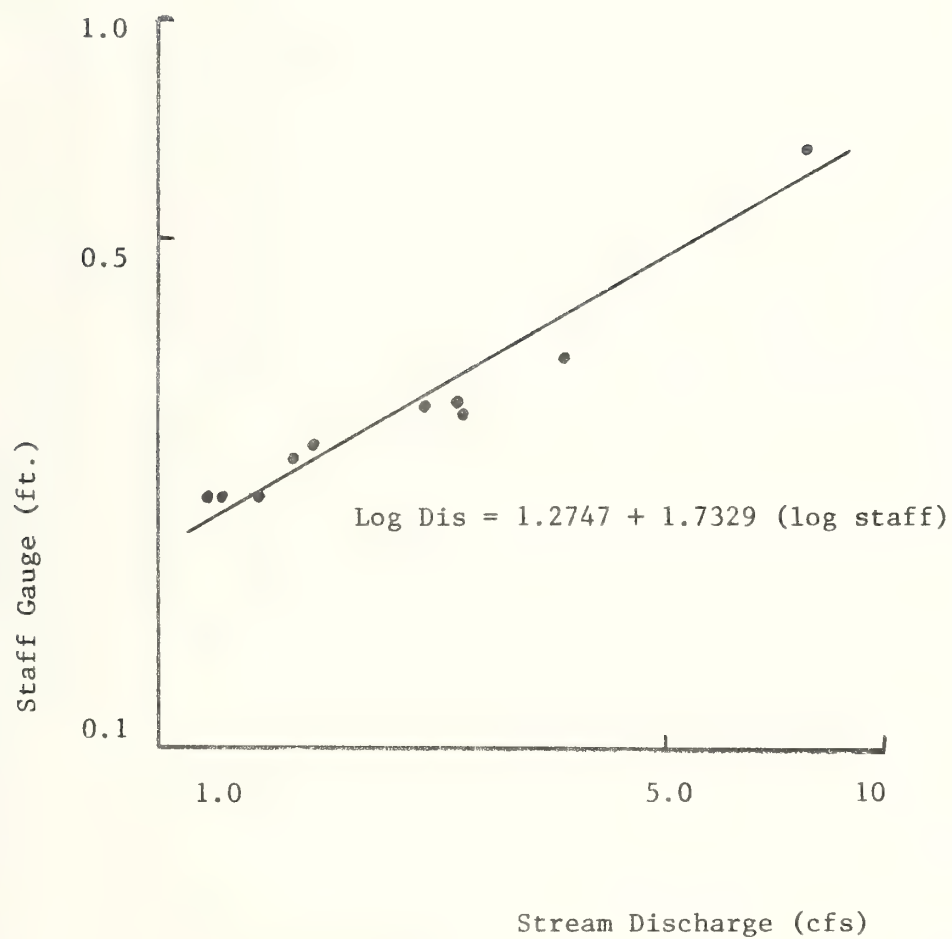


Figure 115. Staff-discharge Rating Curve for the Upper Jeff Davis Station.

FIGURE 116. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER JEFF DAVIS - 1977

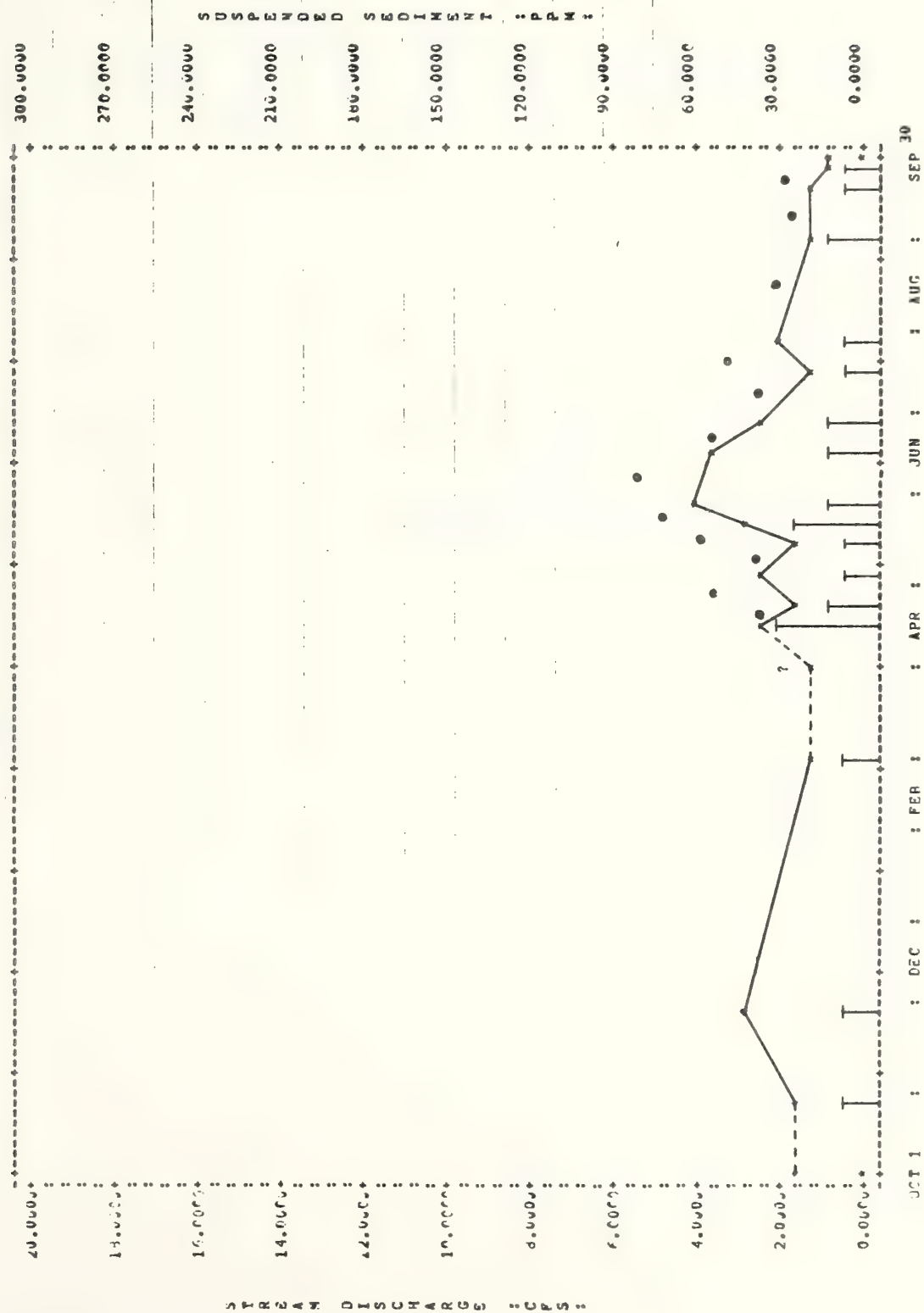


FIGURE 117. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER JEFF DAVIS - 1978

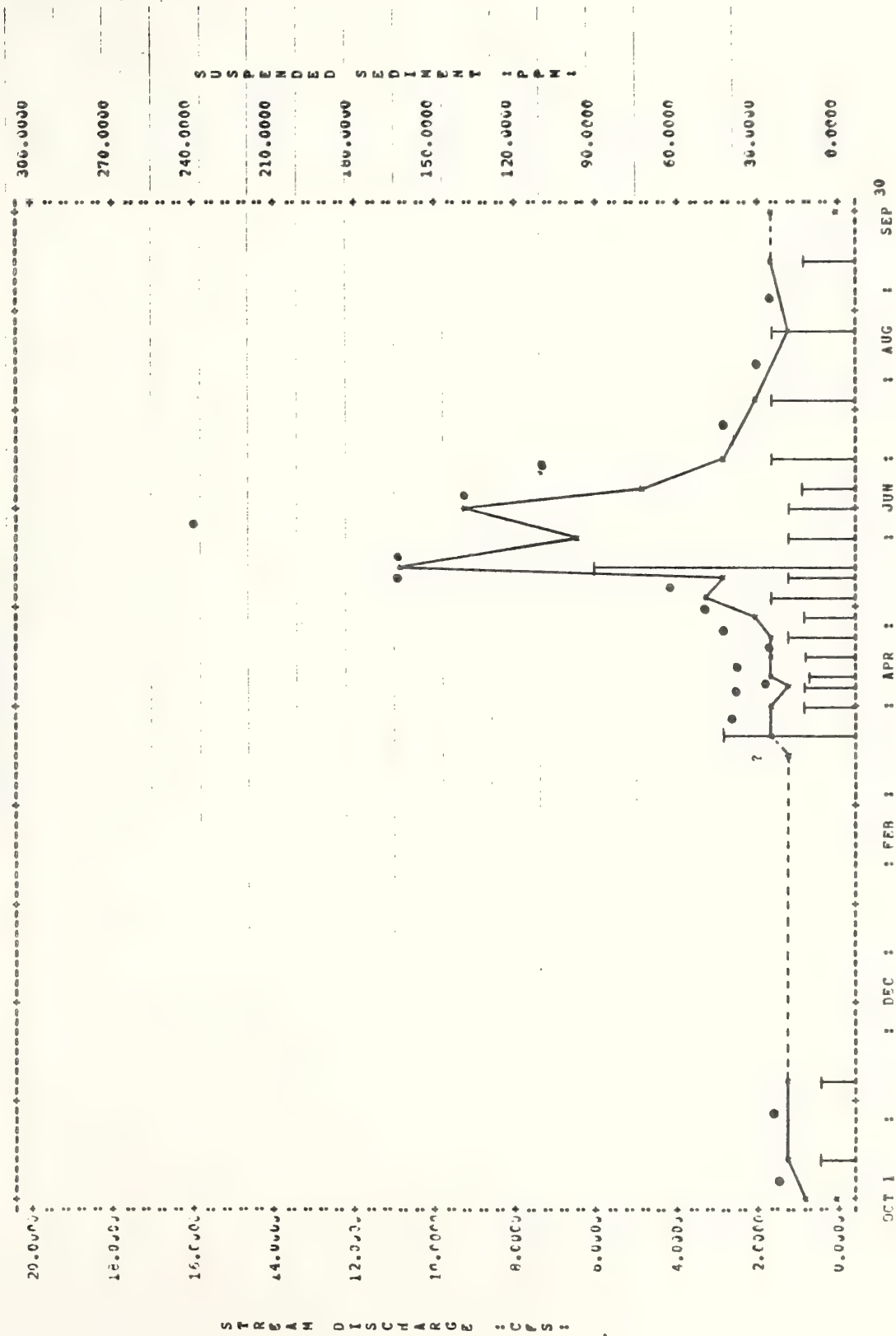


FIGURE 118. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER JEFF DAVIS - 1977

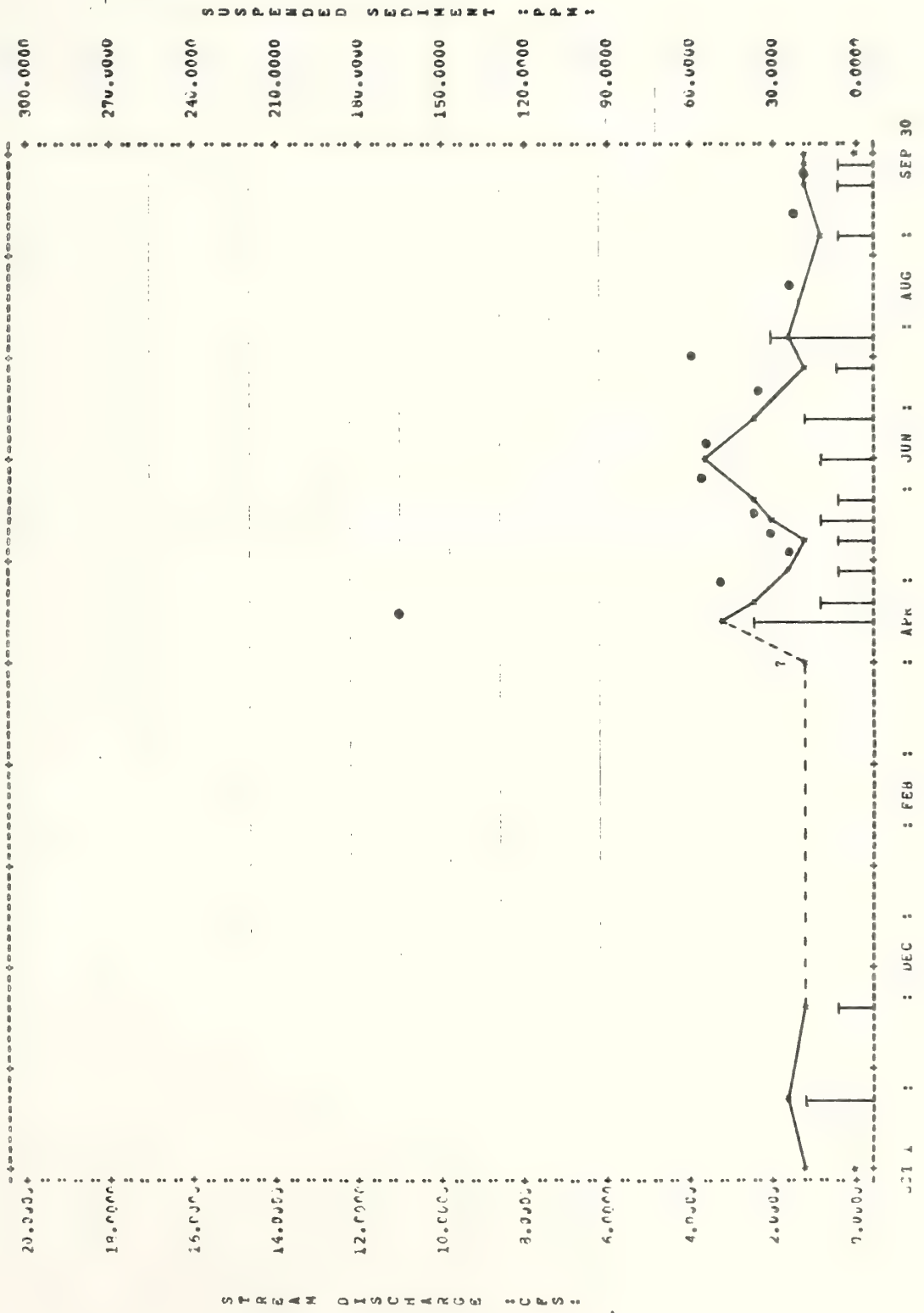
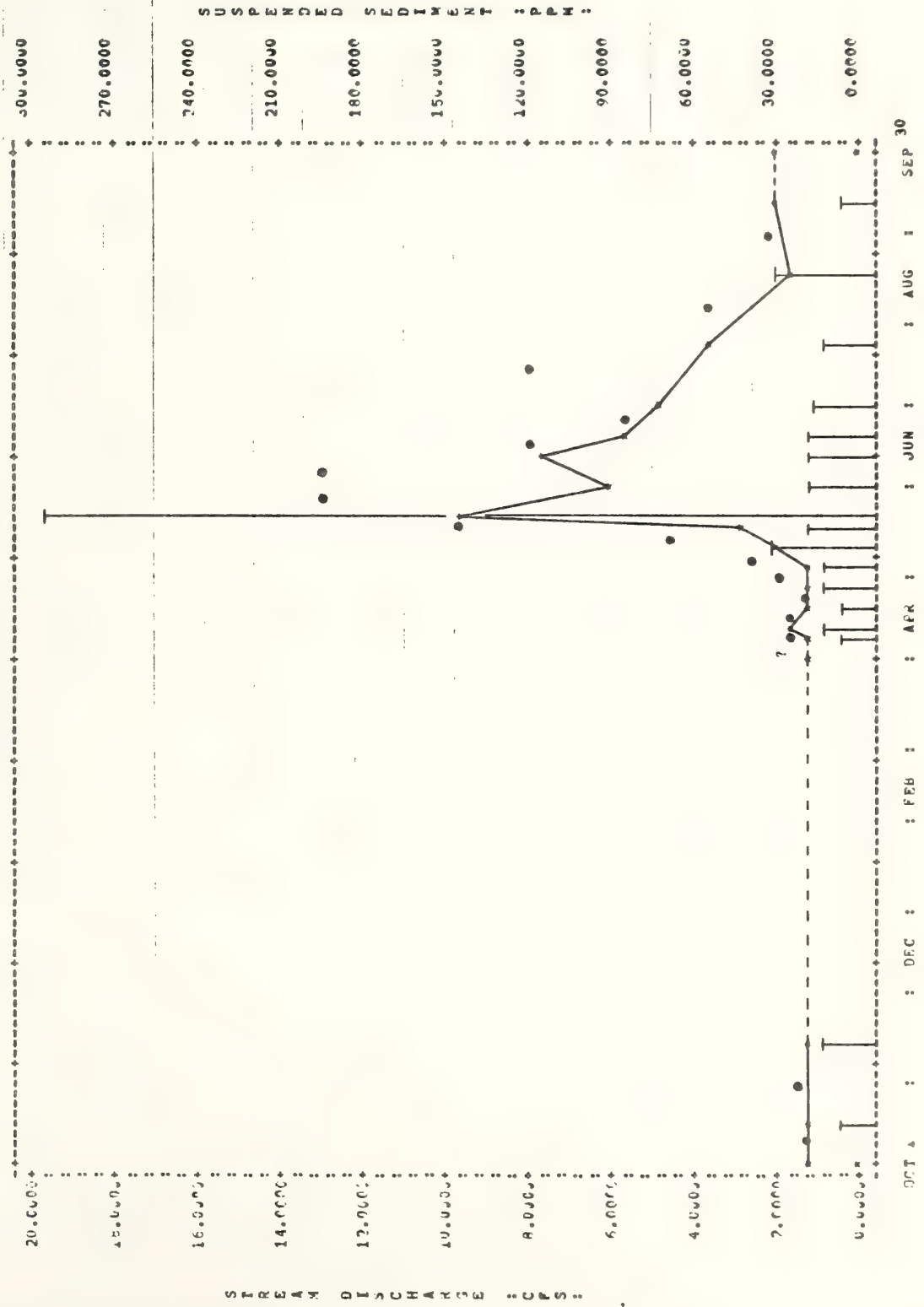


FIGURE 119. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER JEFF DAVIS - 1978



an estimated crest stage value of 5.6 cfs, although a higher discharge may have occurred prior to the first sampling visit. The lowest recorded flow during 1977 was only 0.98 cfs during late September. The 1978 seasonal peak discharge of 16 cfs occurred in early June. The lowest recorded flow for 1978 was 1.2 cfs in mid-October, early April, and mid-August. The Upper Jeff Davis station data indicate an estimated peak discharge of 11 cfs in mid-April, 1977, although a higher flow may have occurred previously. The lowest recorded flow for the year was 0.96 cfs in late August. In 1978, an annual peak flow of 13 cfs occurred in early June, while the lowest flow was recorded at 1.2 cfs for October, early April, and late April. The differences noted in flow patterns for the two hydrologic years are largely attributed to differences in the annual precipitation and snow melt patterns.

The respective annual hydrograph data were used to estimate the annual water yields for each station (Table 34). In both years, the estimated water yields for the two Jeff Davis stations were similar. These values approximated 1,450 acre feet and 1,170 acre feet respectively, for the Lower and Upper stations in 1977, and 1,630 acre feet and 1,700 acre feet respectively in 1978. A larger relative increase in water yield was noted for the Upper station of this westerly facing basin.

Suspended Sediment

The annual patterns of sediment concentrations for each station by hydrologic year are depicted in Figures 116-119. Suspended sediment concentrations at the Lower Jeff Davis station ranged from < 5 ppm at low flow to 91 ppm at high flow, while those for the Upper station ranged from < 5 ppm to 294 ppm. The relationships between suspended sediment and stream discharge for each station were statistically significant, and are presented in Figures 120 and 121. The variability in sediment concentration with

Table 34. Estimated Water and Sediment Yields for Jeff Davis Creek, 1977 - 1978.

Station Name	Water Year	Estimated Water Yield (ac. - ft.)	Estimated Sediment Yield	Contributing Watershed (acres)	Runoff (in./ac.)	Sediment Yields (lbs/acre)
Lower Jeff Davis Station	1977	1,450	19	8,010	2.17	4.80
	1978	1,630	52	8,010	2.44	13.1
Upper Jeff Davis Station	1977	1,170	19	4,380	3.21	8.74
	1978	1,700	98	4,380	4.66	44.9

* Approximately two-thirds of estimated yield attributed to high sediment concentrations during a 8.5-day flow period.

FIGURE 120. SUSPENDED SEDIMENT VS STREAM DISCHARGE - LOWER JEFF DAVIS

LOG SED = 0.9459 + 0.5339(LOG DIS)

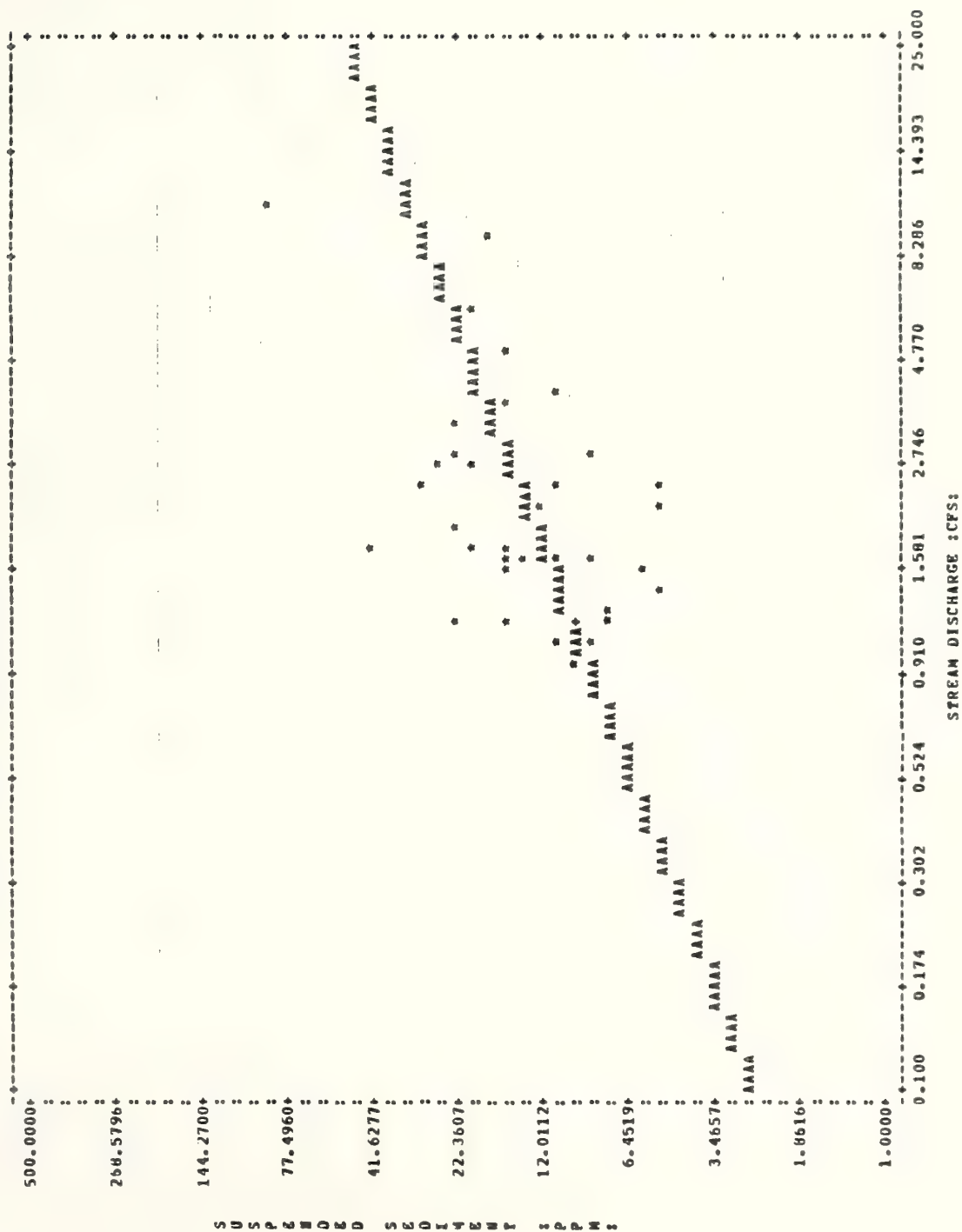
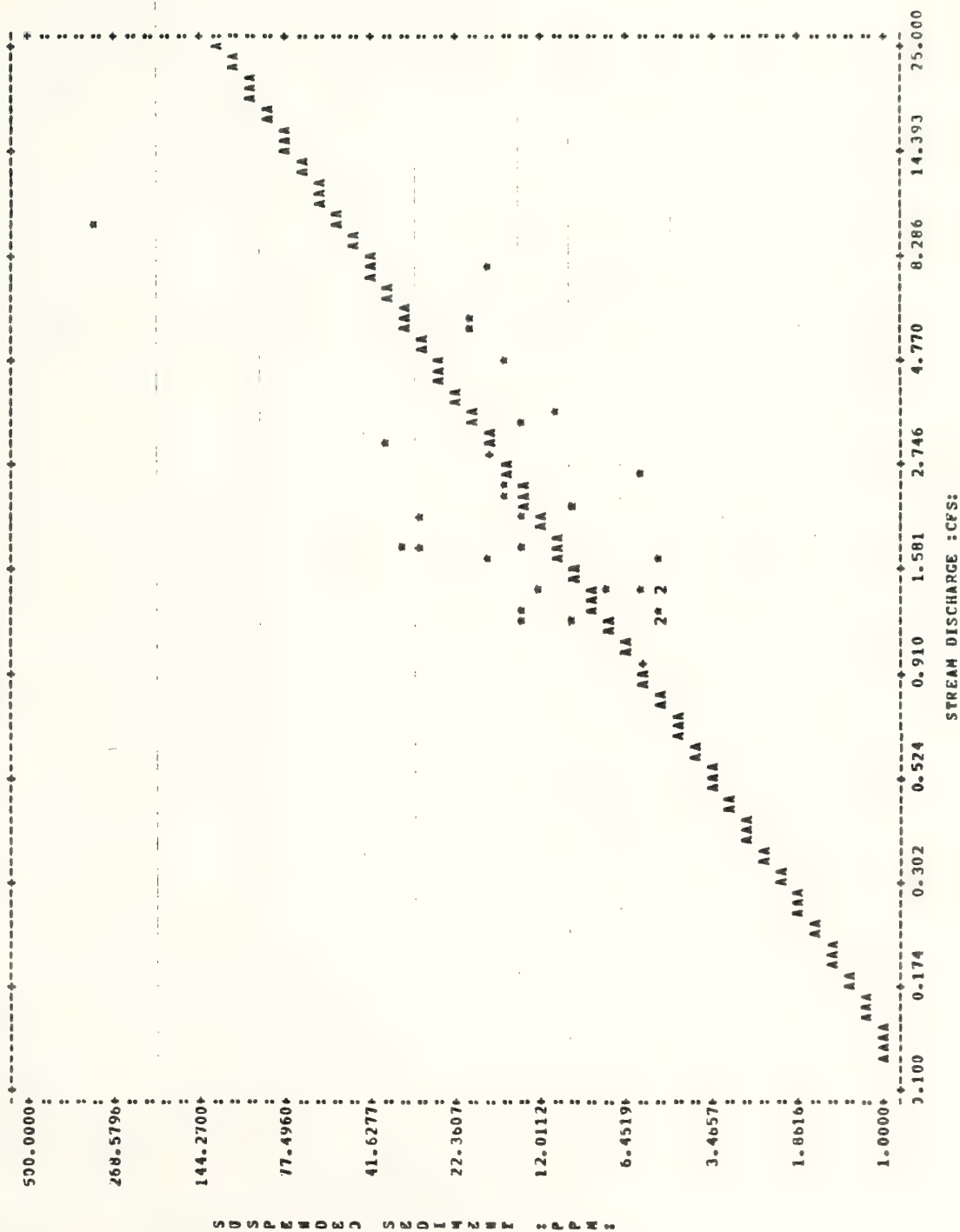


FIGURE 121. SUSPENDED SEDIMENT VS STREAM DISCHARGE - UPPER JEFF DAVIS

LOG SED = 0.7968 + 0.9227(LOG DIS)



stream flow is partially attributed to a seasonal effect, specific storm effects, and to the hysteresis effect, whereby peak concentrations of suspended sediment generally occur prior to peak runoff during the rising stage (Gregory and Walling, 1973, pp. 215-219). Annual sediment yields for the two sample stations were estimated from respective water yield and sediment concentration data (Table 34). The Lower and Upper stations produced approximately 19 tons of suspended sediment respectively during 1977. These yields were increased to 52 tons and 98 tons for the 1978 hydrologic year.

Hydrochemical Parameters

The concentration of dissolved solids is inversely related to stream discharge so that lower concentrations occur during periods of high runoff, while higher concentrations are found during periods of low summer base flow (Gunnerson, 1967; Gregory and Walling, 1973, pp. 219-225). Patterns for specific ions, especially the ecologically important ones, often vary from this generalization (Likens, et al., 1977, pp. 74-76).

Specific conductance for the Lower Jeff Davis station ranged from a low of 128 μ mhos to a high of 245 μ mhos. The Upper Jeff Davis station exhibited a similar pattern, values ranging from 96 μ mhos to a high of 172 μ mhos. The relationships between specific conductance and stream discharge for each station were statistically significant and are presented in Figures 122 and 123. Variation in specific conductance with stream discharge is partially attributed to seasonal and storm hysteresis effects (Gregory and Walling, 1973, pp. 219-225). The ranges in ionic concentration for specific ions are presented in Table 35.

FIGURE 122. CONDUCTIVITY VS STREAM DISCHARGE - LOWER JEFF DAVIS

LOG COND = 2.3259 - 0.1589(LOG DIS)

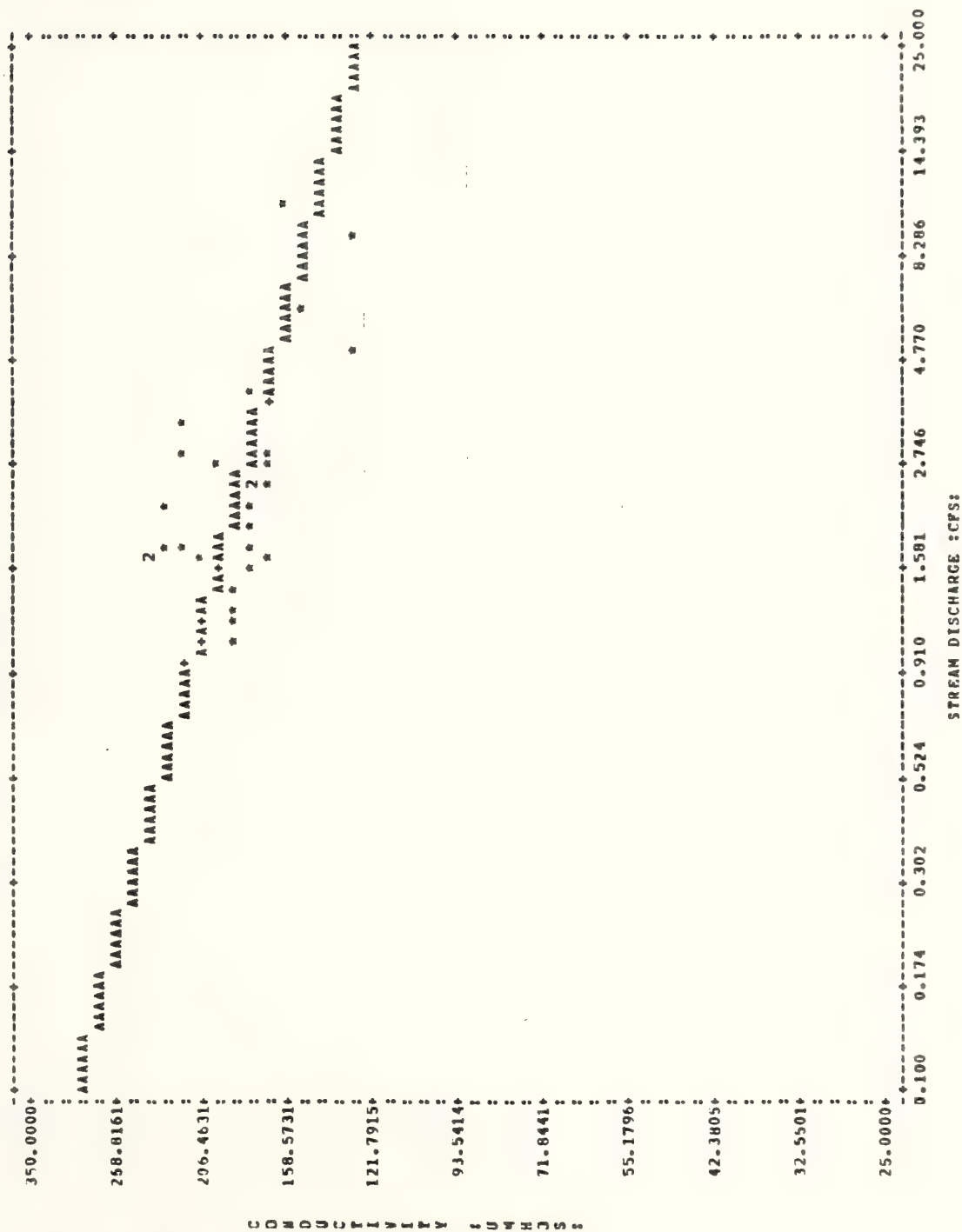


FIGURE 123. CONDUCTIVITY VS STREAM DISCHARGE - UPPER JEFF DAVIS

LOG COND = 2.2287 - 0.1952(LOG DIS)

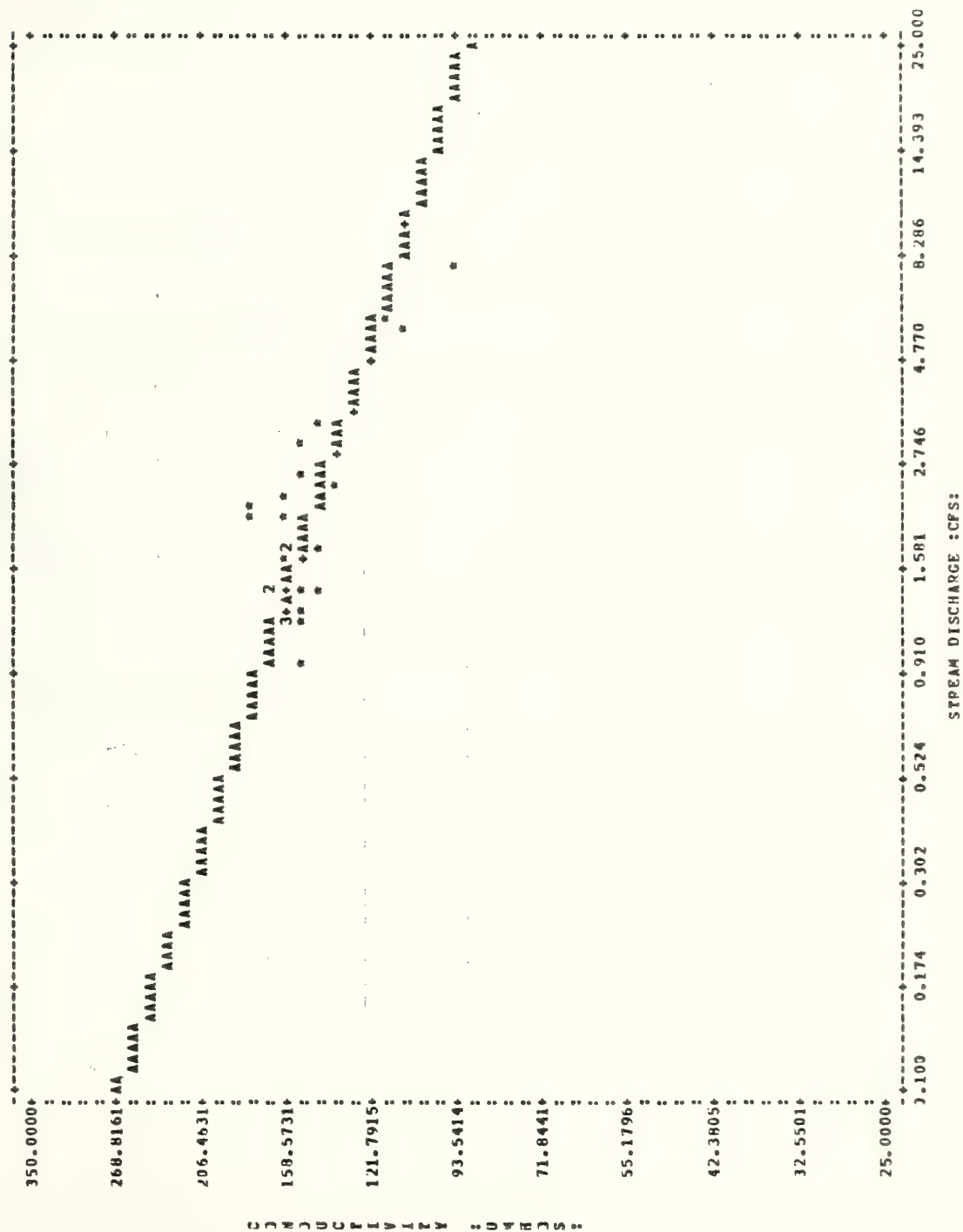


Table 35. Ranges of Hydrochemical Parameter for the Jeff Davis Watershed Sampling Stations, 1977 - 1978.

	Lower Jeff Davis	Upper Jeff Davis
pH	7.45 - 7.95	7.25 - 7.82
Alkalinity (CaCO_3) (mg/l)	67 - 105	53 - 81
Specific Conductance (μmhos)	128 - 245	96 - 172
Total Dissolved Solids (mg/l)	83 - 159	62 - 112
Ca (mg/l)	18 - 34	14 - 22
Mg (mg/l)	6.0 - 10	5.5 - 8.7
Na (mg/l)	4.6 - 8.3	2.4 - 5.8
K (mg/l)	1.4 - 2.4	0.83 - 1.8
HCO_3 (mg/l)	80 - 147	64 - 97
SO_4 (mg/l)	5 - 11	5 - 11
NH_4 (mg/l)	<0.01 - 0.17	<0.01 - 0.18
$\text{NO}_2 + \text{NO}_3 - \text{N}$ (mg/l)	<0.01 - 0.09	<0.01 - 0.23
PO_4 (Ortho) -P (mg/l)	0.022 - 0.078	0.004 - 0.014

Bacteria Levels.

The concentration of fecal and total coliform in streams draining rangeland watersheds is directly related to the number of cattle present, their access to the stream, the physical and hydrological characteristics of the basin, local weather conditions (Kunkle, 1970; Stephensen and Street, 1978), and the time of day (Kunkle and Meiman, 1968). Seasonal patterns include a spring "flushing" effect during the rising stage (Kunkle and Meiman, 1968), with high counts during the low flow summer period, counts which often continue for some period after the cattle have been removed from the area (Stephensen and Street, 1978). This seasonal pattern may briefly be modified by local storms which produce their own "flushing" effect, and which may or may not be followed by a short term dilution period.

The concentrations of fecal coliform for the Lower and Upper Jeff Davis stations for the study period are presented in Table 36. Higher values occurred during the grazing season, but were not always concomitant with the known presence of livestock. Maximum fecal coliform levels were 580 and 116 colonies/100 mls respectively for each station. Approximately 15 percent of the sample coliform counts for Lower Jeff Davis exceeded the 200 colony/100 ml limit of the Montana Water Quality Criteria. The Upper station had no exceptions. Low values were associated with the spring season.

Comments

The water yields for the basin for the two years were generally similar, although the flow regimes differed. Sediment yields per acre are quite low for a disturbed, i.e. surface mined, watershed. This conclusion is supported by the 'good' channel stability rating (65) of the stream environs. Because of the limited number of samples taken and the nature of the hydrochemical parameters evaluated, relationships between the water quality characteristics

Table 36. Fecal coliform counts (colonies/100 mls) for the Jeff Davis Watershed Sampling Stations, 1977 - 1978.

	Lower Jeff Davis		Upper Jeff Davis	
	1977	1978	1977	1978
April		< 10		< 10
May	11	1	7	< 1
June	580(?)	9*	32*	17*
July	200(?)	67(?)	116(?)	59*
August	65 (?)	180(?)	40*	81(?)
September	115*	57*	6	43(?)
October	4		4	
November	36		18	

* Stock visually present.

(?) Stock presence uncertain.

of Jeff Davis Creek and the Montana Water Quality Criteria cannot be addressed.

Shenon Creek Basin

The Shenon Creek sample basin was visited a total of 16 and 18 times during the two hydrologic years. There were no specific accessibility problems; however, an extremely unstable channel cross section, irrigation diversion, and residual channel ice in early 1977 hampered the sampling process. The Upper station was monitored 15 and 17 times respectively.

Channel Stability Ratings

Shenon Creek was evaluated on September 2, 1976. That portion of Shenon Creek between the Lower station and approximately opposite the Mansfield Cow Camp was rated at 'fair' (88) (Table 37).

Precipitation

Precipitation was measured at the Upper Shenon precipitation station from April 23 through November 11, 1977 and from April 6 through September 13, 1978. The general precipitation patterns during these two fiscal years are compared to those of the Dillon and Lima weather stations (Figure 124). Greater precipitation fell in at the Upper Shenon station during the 1977 field season, especially during May and June.

Stream Discharge

The staff-discharge rating curves for the Lower Shenon and Upper Shenon sampling stations are presented in Figures 125 and 126. The Upper Shenon gauging site remained relatively stable during the two sampling years. The Lower Shenon station also remained relatively stable for this period;

Table 37 R-1 STREAM CHANNEL STABILITY FIELD EVALUATION FORM

Shenon

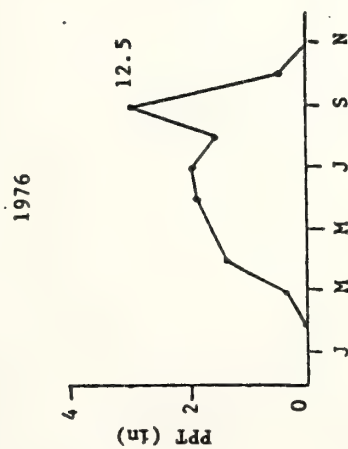
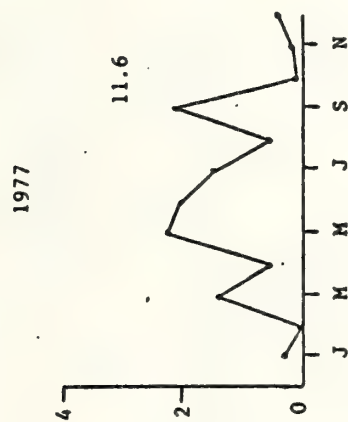
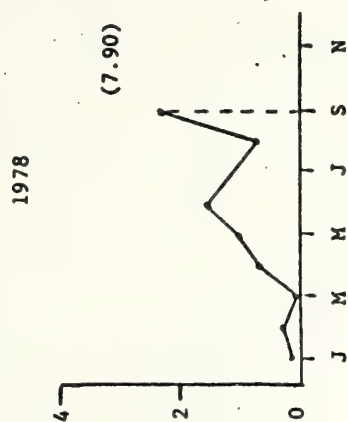
9/2/76

Item Rated	Stability Indicators by Classes			
	EXCELLENT	GOOD	FAIR	POOR
I. UPPER BANKS				
Landform Slope	Bank slope gradient <30%. No evidence of past or potential for future mass wasting into channels.	(2) Bank slope gradient 30-40%. Infrequent and/or very small, mostly healed over. Low future potential.	(4) Bank slope gradient 40-60%. Moderate frequency & size, with some raw spots eroded by water during high flows.	(6) Bank slope gradient 60% +. Frequent or large, causing sediment nearly yearlong OR imminent danger of same.
Debris Jam Potential (Floatable Objects)	Essentially absent from immediate channel area.	(2) Present but mostly small twigs and limbs.	(4) Present, volume and size are both increasing.	(6) Moderate to heavy amounts, predominantly larger sizes.
Bank Protection from Vegetation	90% + plant density. Vigor and variety suggests a deep, dense root mass.	(3) species or lower vigor suggests a less dense or deep root mass.	(6) 50-70% density. Lower vigor and still fewer species form a somewhat shallow and discontinuous root mass.	(9) species & less vigor indicate poor, discontinuous, and shallow root mass.
II. LOWER BANKS				
Channel Capacity	Ample for present plus some increases. Peak flows contained. W/D ratio <7.	(1) Adequate. Overbank flows rare. Width to Depth (W/D) ratio 8-15.	(2) Barely contains present peaks. Occasional overbank floods. W/D ratio 15-25.	(3) Inadequate. Overbank flows common. W/D ratio >25.
Bank Rock Content	65% + with large, angular boulders 12" + numerous. Rocks, old logs firmly embedded. Flow pattern of pool & riffles stable without cutting or deposition.	(2) 40 to 65%, mostly small boulders to cobble 6-12". Some present, causing erosive cross currents and minor pool filling. Obstructions and deflectors newer and less firm.	(4) 20 to 40%, with most in the 3-6" diameter class. Moderately frequent, moderately unstable obstructions & deflectors move with high water causing bank cutting and filling of pools.	(6) <20% rock fragments of gravel sizes, 1-3" or less. Frequent obstructions and deflectors cause bank erosion yearlong. Sed. traps full, channel migration occurring.
Obstructions Flow Deflectors Sediment Traps	Little or none evident. Infrequent raw banks less than 6" high generally. Little or no enlargement of channel or point bars.	(4) Some, intermittently at outcrops & constrictions. Raw banks may be up to 12". Some new increases in bar formation, most from coarse gravels.	(8) Significant. Cuts 12"-24" high. Root mat overhangs and sloughing evident. Moderate deposition of new gravel & coarse sand on old and some new bars.	(12) Almost continuous cuts. Some over 24" high. Failure of overhangs frequent. Extensive deposits of predominantly fine particles. Accelerated bar development.
III. BOTTOM				
Rock Angularity	Sharp edges and corners, plane surfaces roughened.	(1) Rounded corners & edges, surfaces smooth & flat.	(2) Corners & edges well rounded in two dimensions.	(3) Well rounded in all dimensions, surfaces smooth.
Brightness	Surfaces dull, darkened, or stained. Gen. not "bright".	(1) Mostly dull but may have up to 35% bright surfaces.	(2) Mixture, 50-50% dull and bright, ± 15%, ie 35-65%.	(3) Predominately bright, 65% +. Exposed or scoured surfaces.
Consolidation or Particle Packing	Assorted sizes tightly packed and/or overlapping.	(2) Moderately packed with some overlapping.	(4) Mostly a loose assortment with no apparent overlap.	(5) No packing evident. Loose assortment, easily moved.
Bottom Size Distribution & Percent Stable Materials	No change in sizes evident. Stable materials 80-100%. Less than 5% of the bottom affected by scouring and deposition.	(4) Distribution shift slight. Stable materials 50-80%. 5-10% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	(8) Moderate change in sizes. Stable materials 20-50%. 30-50% affected. Deposits & scour at obstructions, constrictions, and bends. Some filling of pools.	(10) Marked distribution change. Stable materials 0-20%. More than 50% of the bottom in a state of flux or change nearly yearlong.
Scouring and Deposition	Abundant. Growth largely moss like, dark green, perennial. In swift water too.	(1) Common. Algal forms in low velocity & pool areas. Moss here too and swifter waters.	(12) Present but spotty, mostly in backwater areas. Seasonal blooms make rocks slick.	(14) Perennial types scarce or absent. Yellow-green, short term bloom may be present.
Clinging Aquatic Vegetation (Moss & Algae)				
COLUMN TOTALS				2

Add the values in each column for a total reach score here. (2.2 + 0.20 + 1.62 + 1.4 = 5.42)

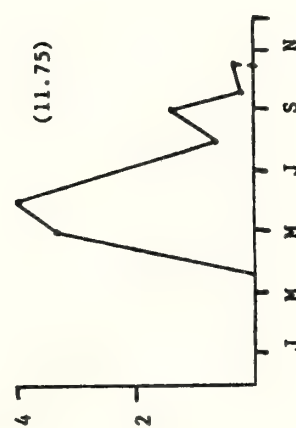
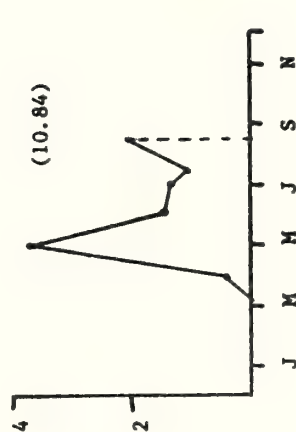
Reach score of: <38-Excellent, 39-76=Good, 77-114= Fair, 115-134=Poor.

RI-2500-3 (6

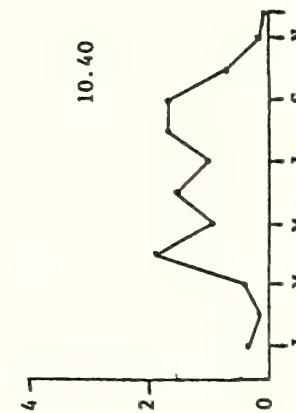
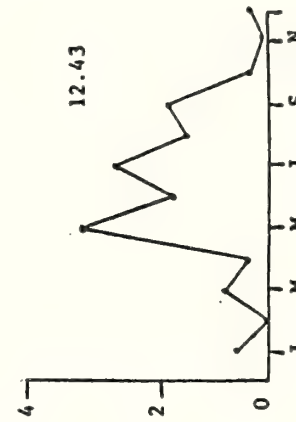
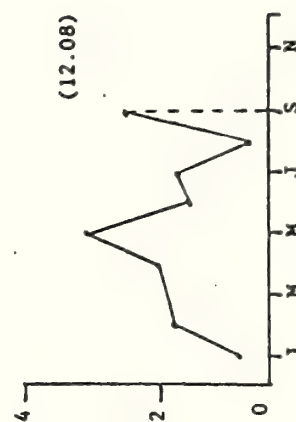


Dillon
Weather
Station

Figure 124. Upper Shenon
Precipitation Data.



Upper Shenon
Precipitation
Station



Lima
Weather
Station

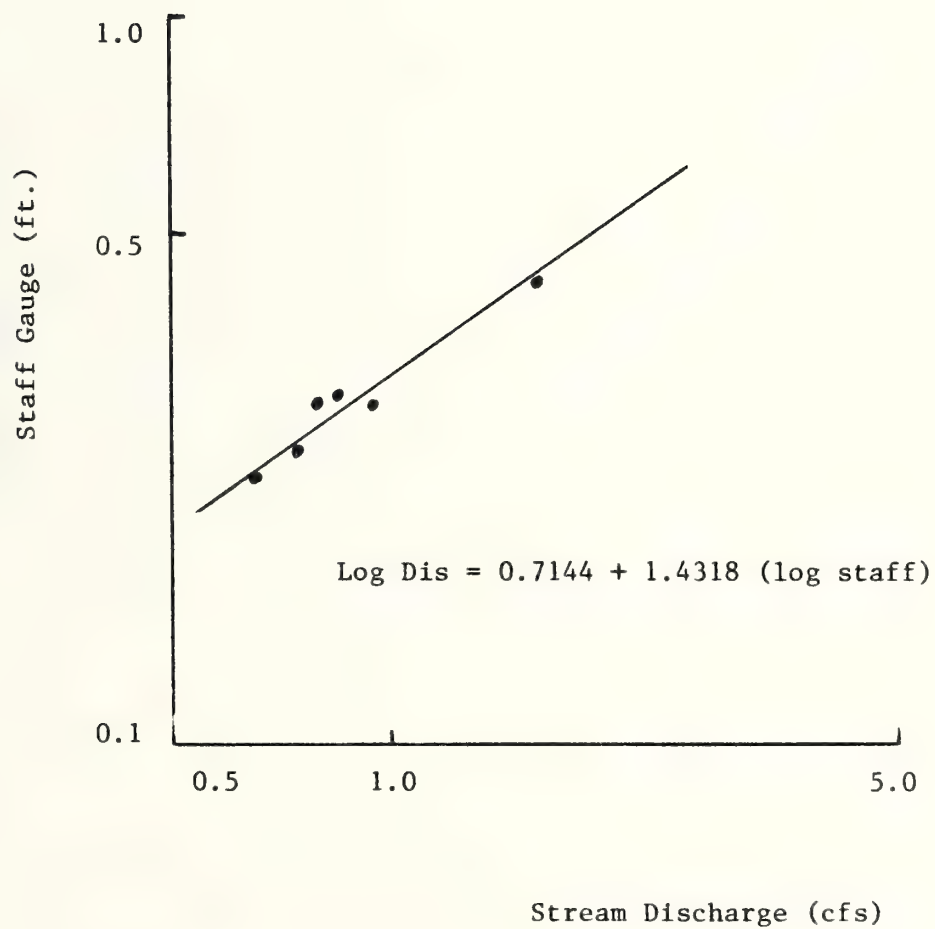


Figure 125. Staff-discharge Rating Curve for the Lower Shenon Station.

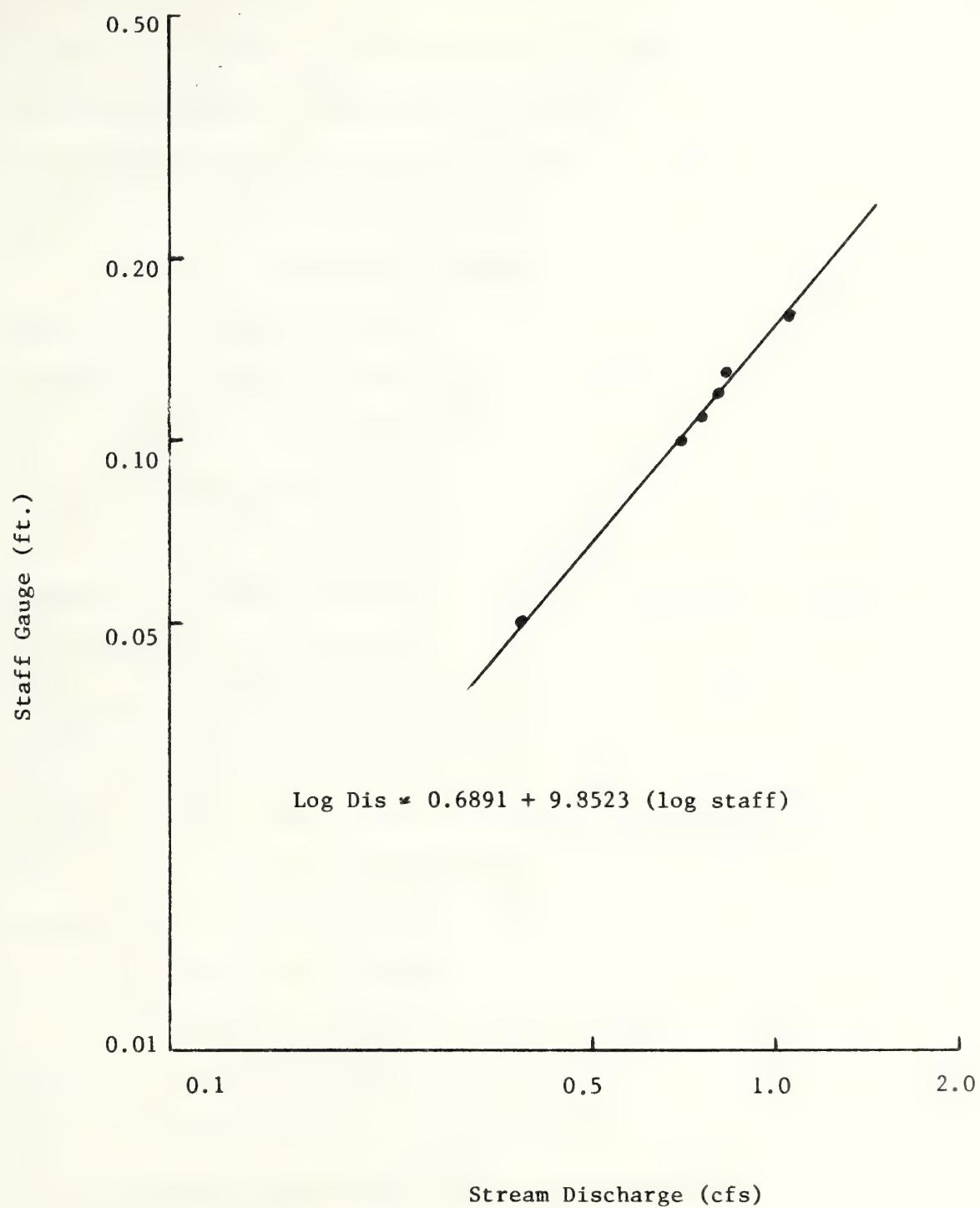


Figure 126. Staff-discharge Rating Curve for the Upper Shenon Station.

however, the majority of stream flow was intermittantly diverted for irrigation purposes. There were no satisfactory alternate sites, and the one selected suffered from unstable conditions owing to the large bed load carried by the stream in this section.

The 1977 and 1978 annual hydrographs for the Lower Shenon and Upper Shenon Creek sampling stations are presented in Figures 127-130. Peak flow during 1977 at the Lower Shenon station apparently occurred in early to mid-April during an unusually warm period. An estimated crest stage value of 5.6 cfs occurred during mid-April, although a higher flow is believed to have occurred over ice prior to the first sampling visit. The lowest recorded flow during 1977 was only 0.63 cfs during early September. The 1978 year produced a peak flow of 3.2 cfs in mid-May. The lowest recorded flow for 1978 was 0.57 cfs in mid-August. At the Upper Shenon station, an estimated peak discharge of 1.9 cfs was noted in mid-April, 1977, although a higher flow may have occurred previously. The lowest recorded flow for the year was 0.38 cfs in mid-September. In 1978, a peak of 1.5 cfs was measured in late May and mid-July, while the lowest flow was recorded at 0.44 cfs in the previous October. The differences noted in flow patterns for the two hydrologic years are largely attributed to differences in the annual and seasonal precipitation and snow release patterns.

The respective annual hydrograph data were used to estimate the annual water yields for each station (Table 38). In both water years, the estimated yield for the Upper Shenon station was approximately two-thirds that of the Lower Shenon station. The data indicate water yields of 968 acre feet and 655 acre feet respectively for 1977 and 740 acre feet and 535 acre feet for 1978. Both stations reflected a decrease in water yield during 1978.

FIGURE 127. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER SHENON - 1977

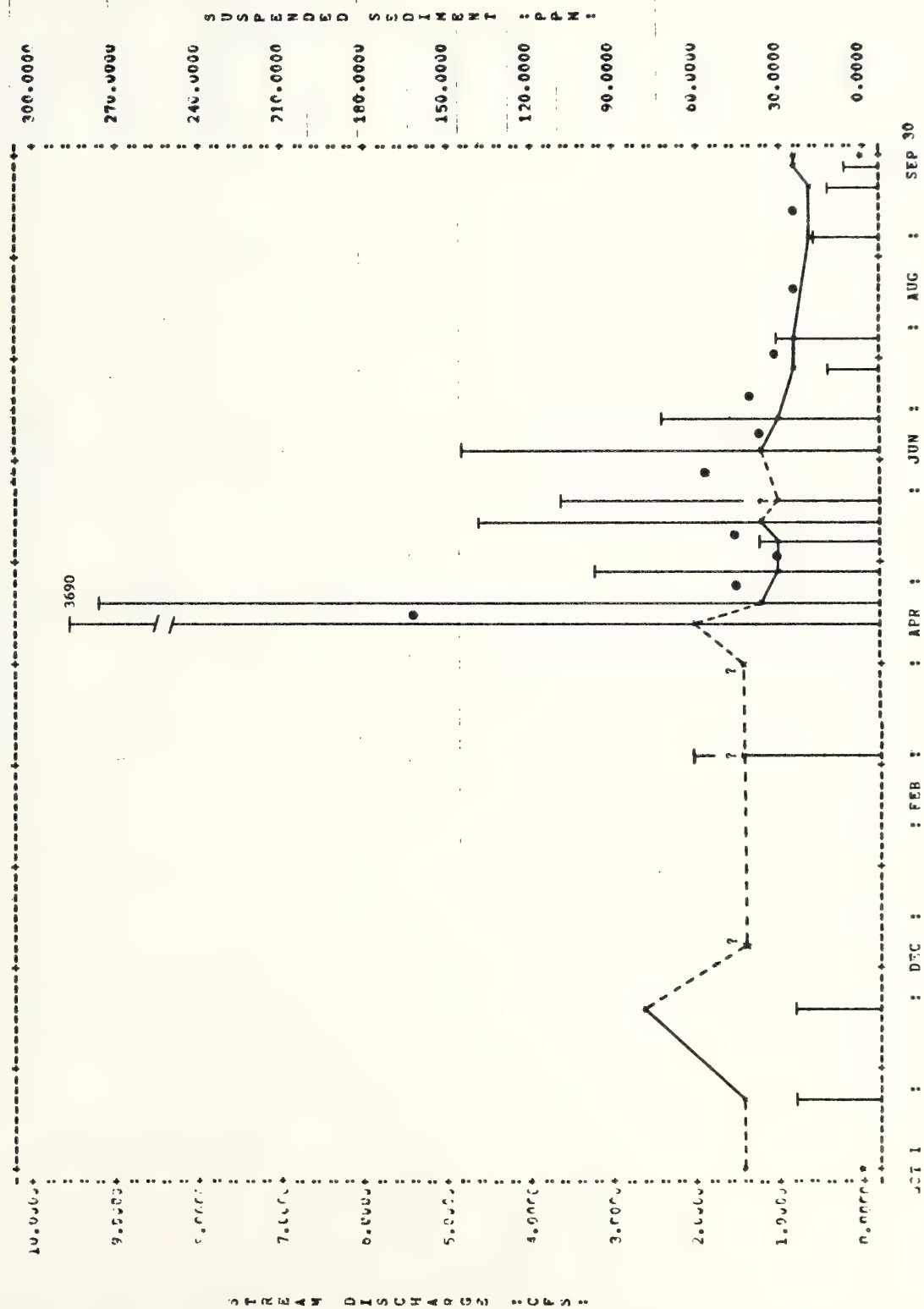


FIGURE 128. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
LOWER SHENON - 1978

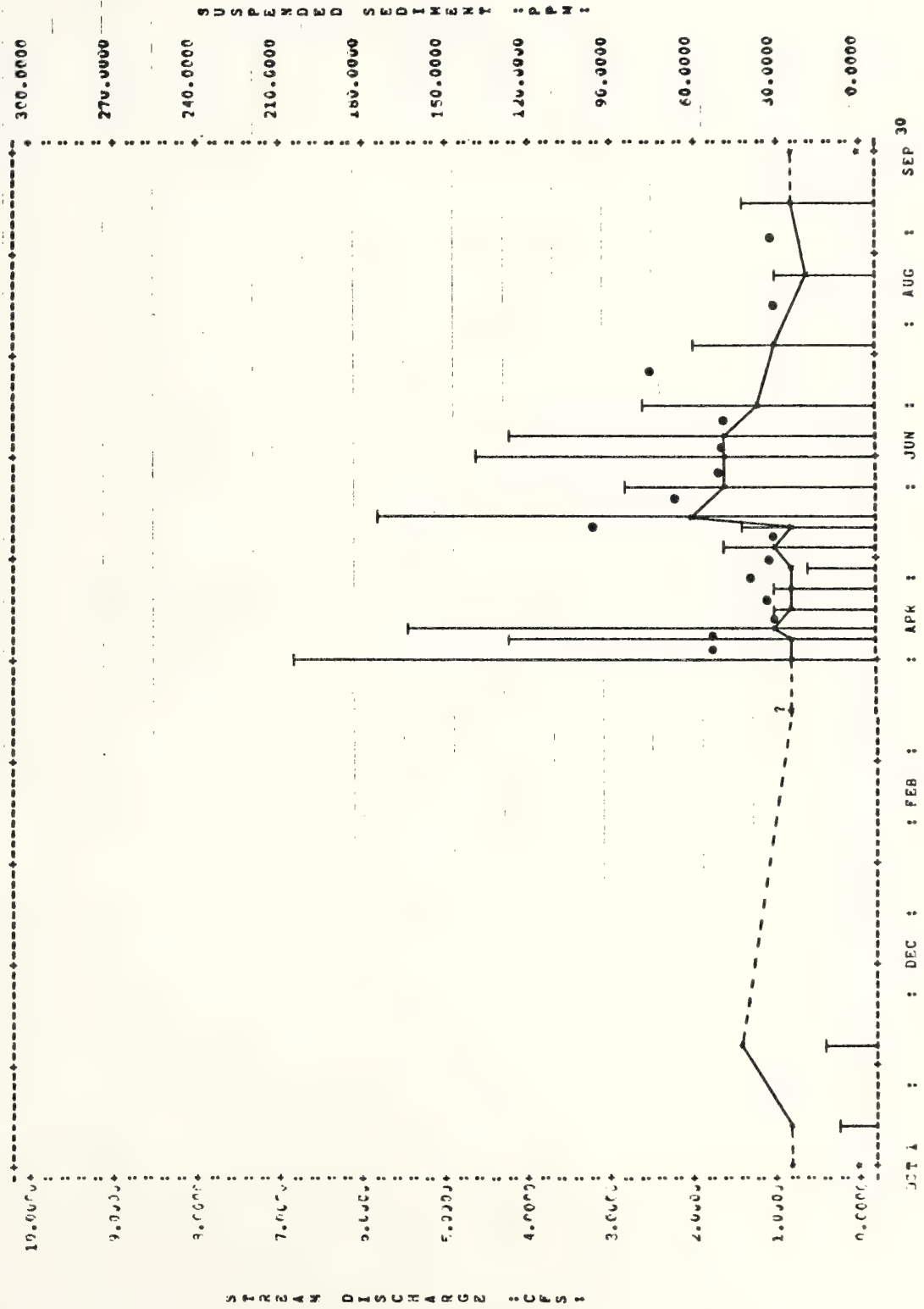
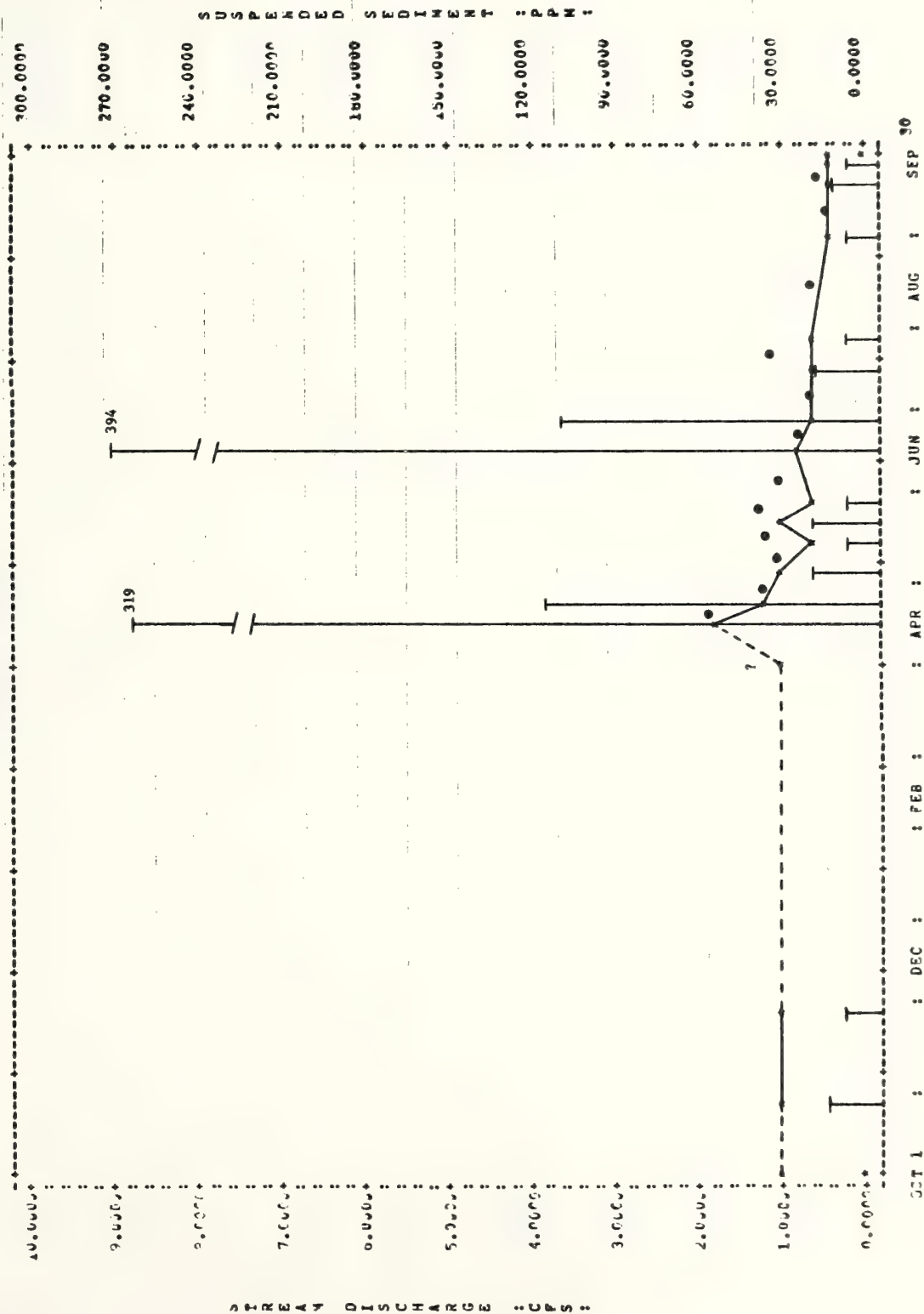


FIGURE 129. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER SHENON - 1977



1910

1910

1910

1910

1910

FIGURE 130. ANNUAL HYDROGRAPH AND SEDIMENT LOADINGS
UPPER SHENON - 1978

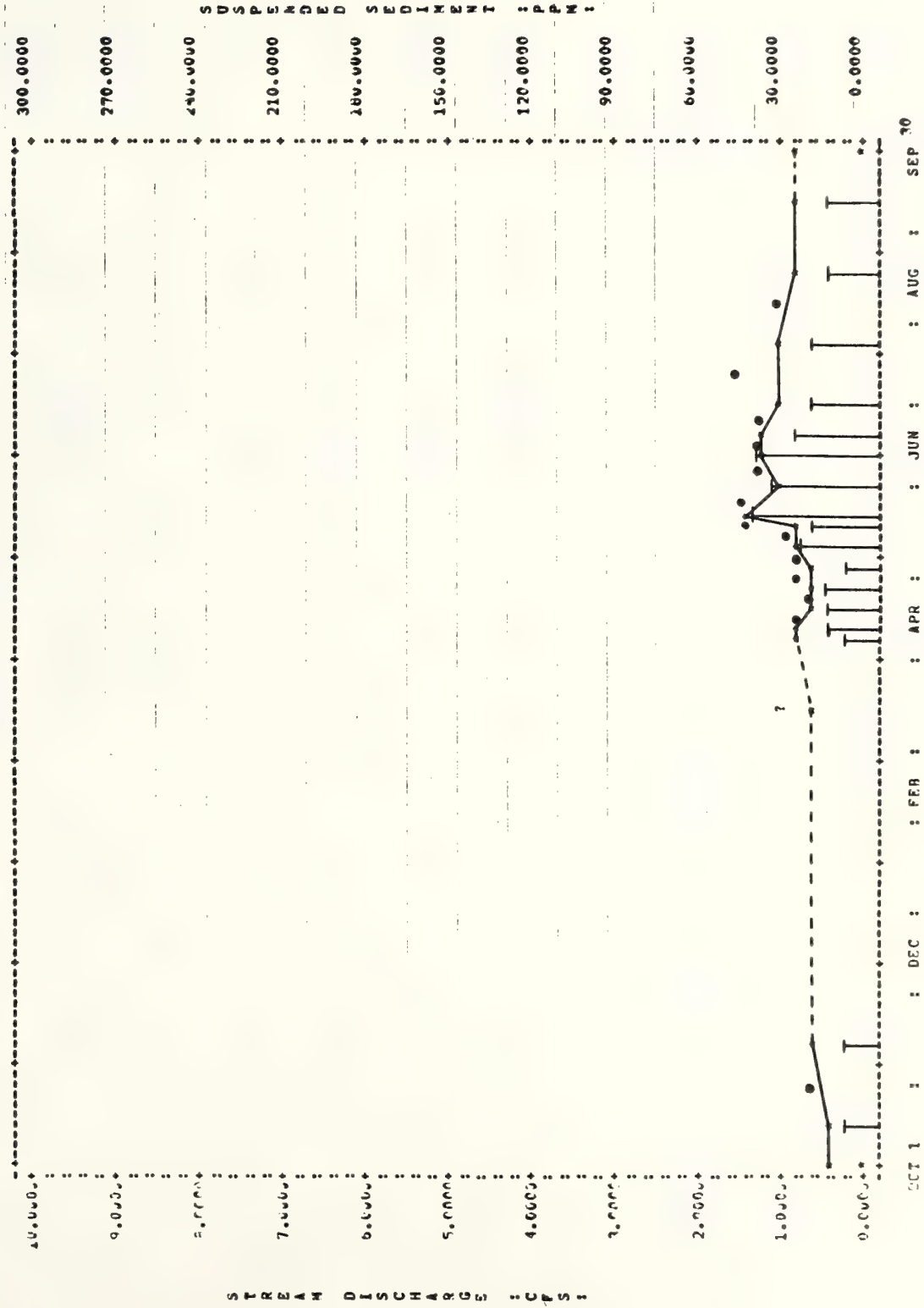
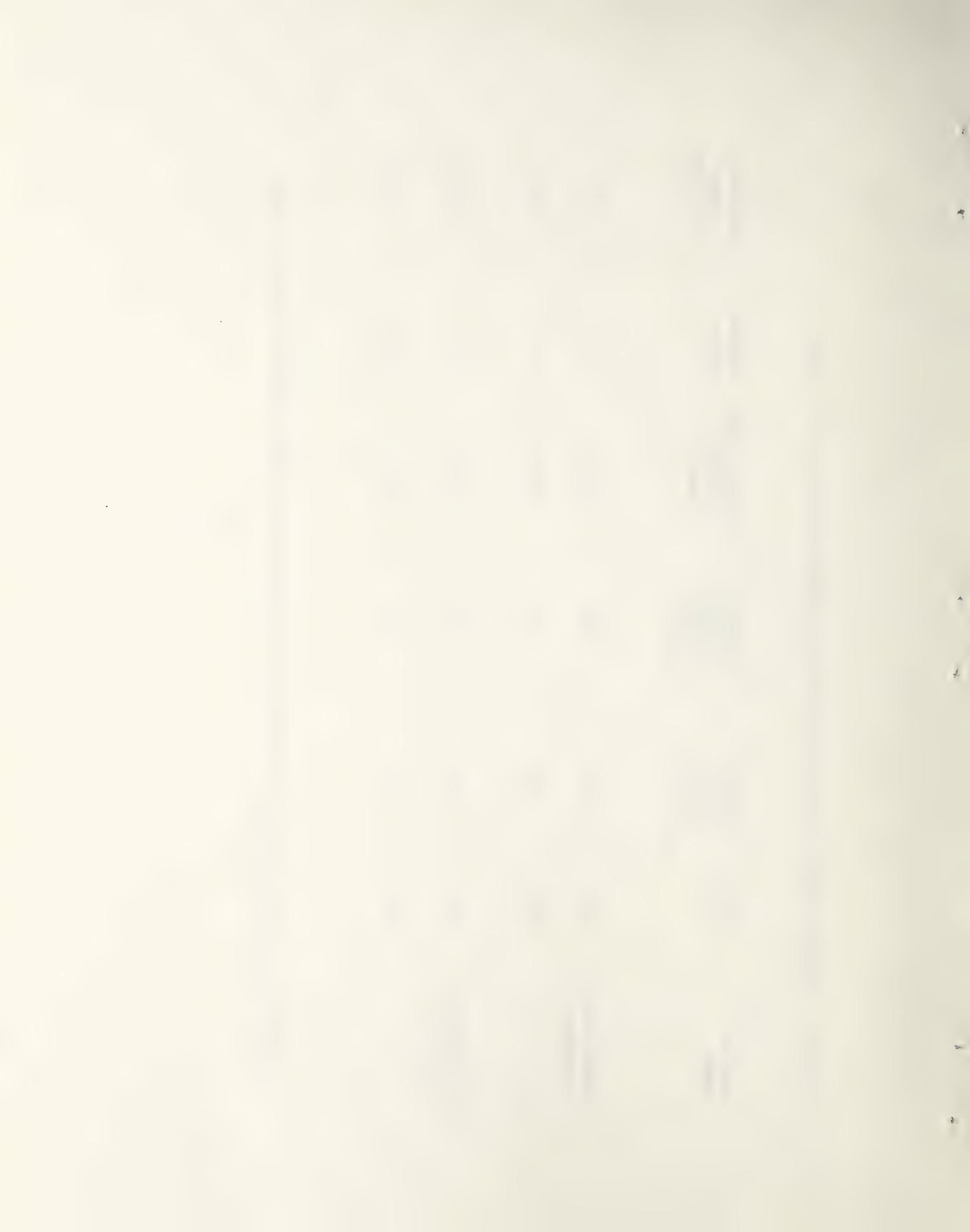


Table 38. Estimated Water and Sediment Yields for Shenon Creek, 1977 - 1978.

Station Name	Water Year	Estimated Water Yield (ac. - ft.)	Estimated Sediment Yield (tons)	Contributing Watershed (acres)	Runoff (in./ac.)	Sediment Yield (lbs/acre)
Lower Shenon Station	1977	968	292*	5,020	2.31	116
	1978	740	51	5,020	1.77	20.3
Upper Shenon Station	1977	655	42	2,430	3.23	34.9
	1978	535	10	2,430	2.64	8.22

* Approximately three quarters of estimated yield attributed to high sediment concentrations during an 11-day flow period .



Suspended Sediment

The annual patterns of sediment concentrations for each station by hydrologic year are depicted in Figures 127-130. Suspended sediment concentrations at the Lower Shenon station ranged from < 5 ppm to 3690 ppm, while those for the Upper station ranged from < 5 ppm to 384 ppm. The relationships between suspended sediment and stream discharge for each station were statistically significant, and are presented in Figures 131 and 132. The variability in sediment concentration with stream flow is partially attributed to a seasonal effect, specific storm effects, the presence of livestock, and to the hysteresis effect, whereby peak concentrations of suspended sediment generally occur prior to peak runoff during the rising stage (Gregory and Walling, 1973, pp. 215-219). Annual sediment yields for the two sample stations were estimated from respective water yield and sediment concentration data (Table 38). The Lower and Upper stations produced approximately 292 tons and 42 tons of suspended sediment respectively during 1977. These yields were reduced to 51 tons and 10 tons for the 1978 hydrologic year.

Hydrochemical Parameters

The concentration of dissolved solids is inversely related to stream discharge so that lower concentrations occur during periods of high runoff, while higher concentrations are found during periods of low summer base flow (Gunnerson, 1967; Gregory and Walling, 1973, pp. 219-225). Patterns for specific ions, especially the ecologically important ones, often vary from this generalization (Likens, et al., 1977, pp. 74-76).

FIGURE 131. SUSPENDED SEDIMENT VS STREAM DISCHARGE - LOWER SHENON

LOG SED = 1.6891 + 1.7469(LOG DIS)

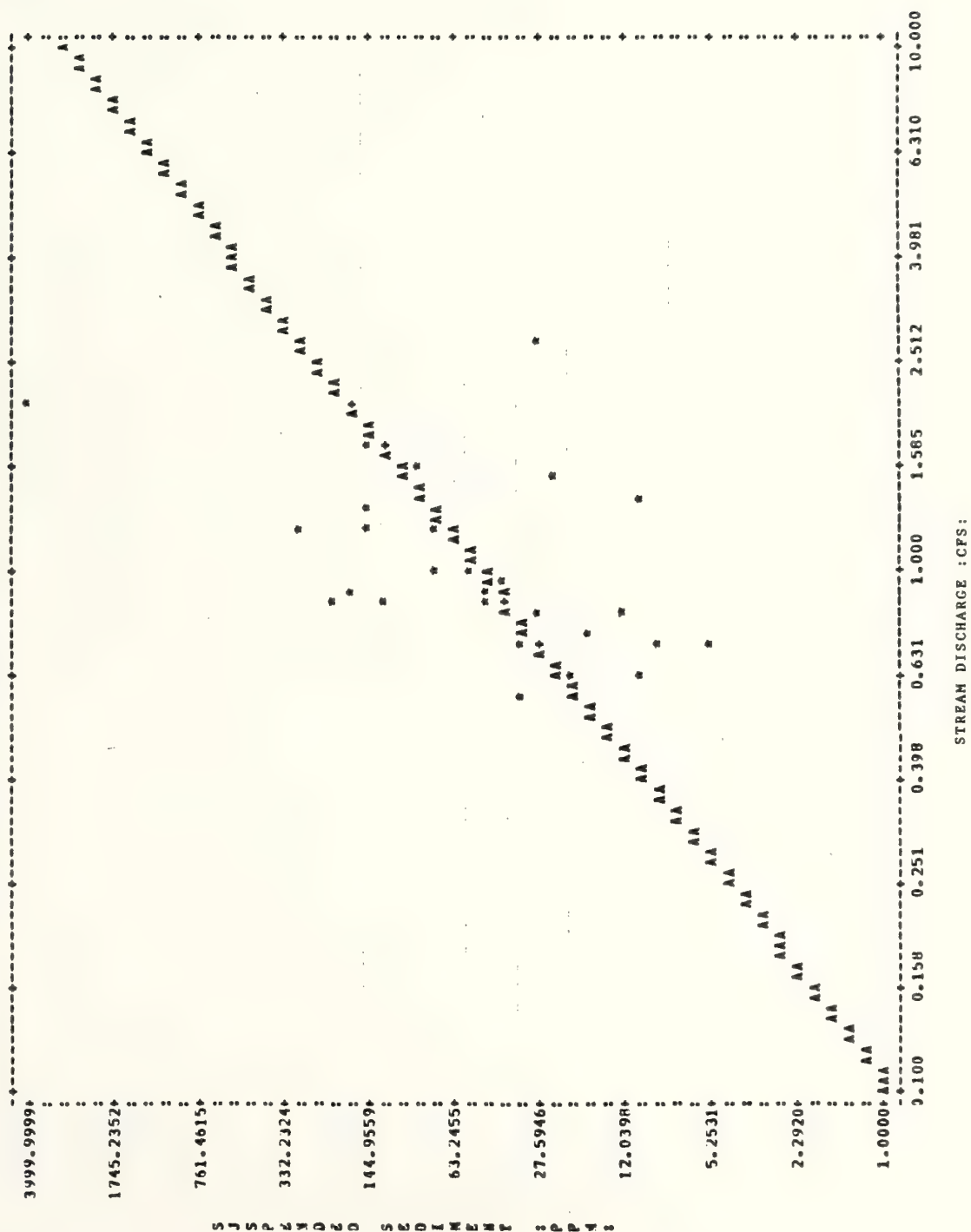
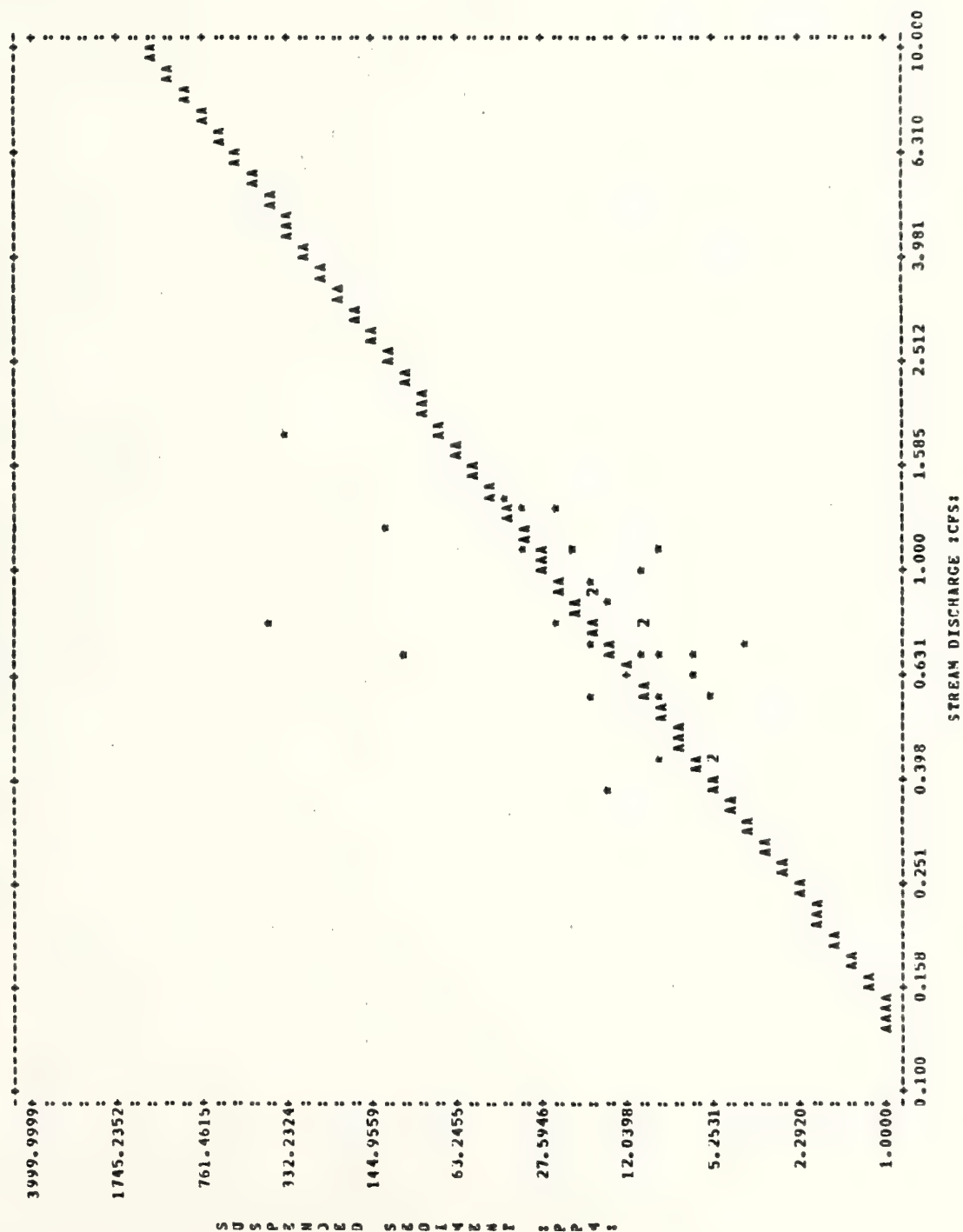


FIGURE 132. SUSPENDED SEDIMENT VS STREAM DISCHARGE - UPPER SHENON

LOG SED = 1.4052 + 1.6916(LOG DIS)



Specific conductance for the Lower Shenon station ranged from a low of 220 μ mhos to a high of 298 μ mhos. The Upper Shenon exhibited values ranging from 132 μ mhos to a high of 238 μ mhos. The relationships between specific conductance and stream discharge for each station were statistically significant and are presented in Figures 133 and 134. Variation in specific conductance with stream discharge is partially attributed to seasonal and storm hysteresis effects (Gregory and Walling, 1973, pp. 219-225). The ranges in ionic concentration for specific ions are presented in Table 39.

Bacteria Levels

The concentration of fecal and total coliform in streams draining rangeland watersheds is directly related to the number of cattle present, their access to the stream, the physical and hydrological characteristics of the basin, local weather conditions (Kunkle, 1970; Stephensen and Street, 1978), and the time of day (Kunkle and Meiman, 1968). Seasonal patterns include a spring "flushing" effect during the rising stage (Kunkle and Meiman, 1968), with high counts during the low flow summer period, counts which often continue for some period after the cattle have been removed from the area (Stephensen and Street, 1978). This seasonal pattern may briefly be modified by local storms which produce their one "flushing" effect, and which may or may not be followed by a short term dilution period.

The concentrations of fecal coliform for the Lower and Upper Shenon Creek stations for the study period are presented in Table 40. Higher values occurred during the grazing season, but were not always concomitant with the known presence of livestock. Maximum fecal coliform levels were TNTC and 1850 colonies/100 mls respectively for each station. Approximately 46 percent and 8 percent of the sample coliform counts exceeded the 200 colony/100 ml limit of the Montana Water Quality Criteria. Low values were

FIGURE 133. CONDUCTIVITY VS STREAM DISCHARGE - LOWER SHENON

LOG COND = 2.4152 - 0.0855(LOG DIS)

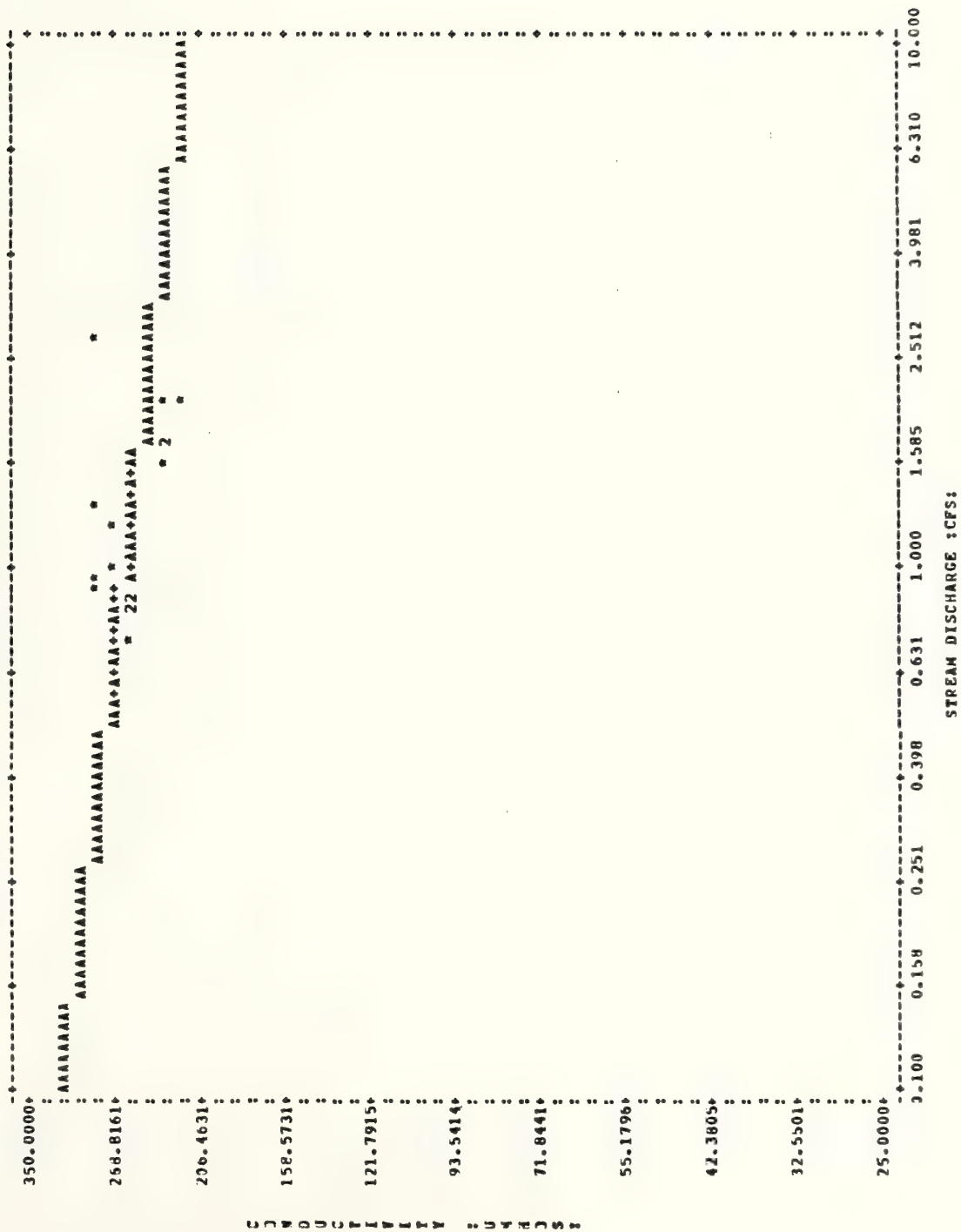


FIGURE 134. CONDUCTIVITY VS STREAM DISCHARGE - UPPER SHENON
LOG COND = 2.321 - 0.1525(LOG DIS)

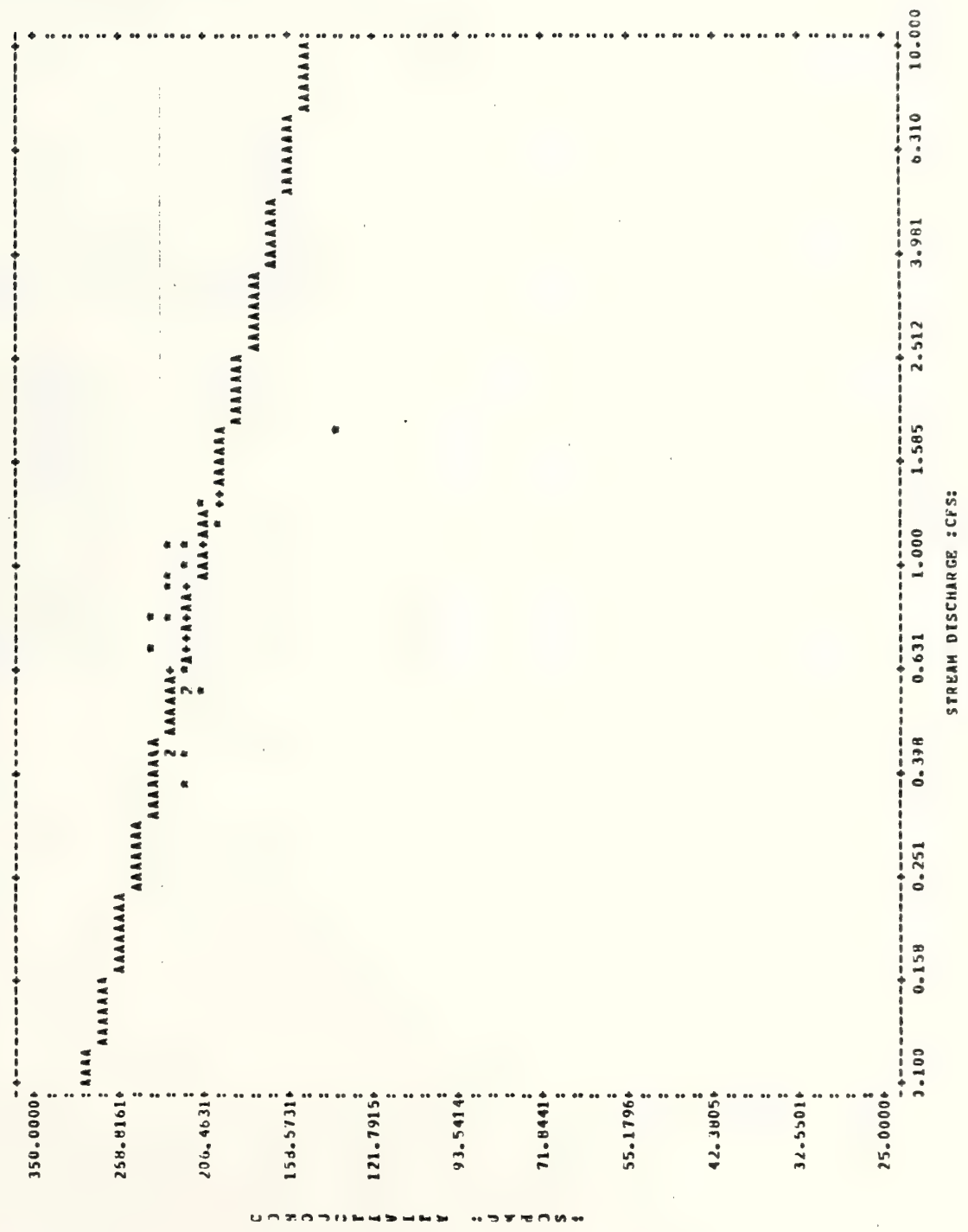


Table 39. Ranges in Hydrochemical Characteristics of the Shenon Watershed
Sampling Stations, 1977 - 1978.

	Lower Shenon	Upper Shenon
pH	7.55 - 8.24	7.35 - 8.02
Alkalinity (CaCO_3) (mg/l)	110 - 137	99 - 121
Specific Conductance (μmhos)	220 - 298	132 - 238
Total Dissolved Solids (mg/l)	143 - 194	86 - 155
Ca (mg/l)	22 - 37	16 - 29
Mg (mg/l)	12 - 16	11 - 16
Na (mg/l)	8.8 - 13	5.9 - 8.5
K (mg/l)	1.5 - 2.4	0.73 - 1.8
HCO_3 (mg/l)	135 - 167	121 - 152
SO_4 (mg/l)	5 - 32	6 - 12
NH_4 (mg/l)	< 0.01 - 0.25	< 0.01 - 0.25
$\text{NO}_3 + \text{NO}_2 - \text{N}$ (mg/l)	< 0.01 - 0.09	< 0.01 - 0.10
PO_4 (Ortho) -P (mg/l)	0.007 - 0.028	0.002 - 0.023

Table 40. Fecal Coliform Counts (colonies/100 mls) for the Shenon Watershed Sampling Stations, 1977 - 1978.

	Lower Shenon		Upper Shenon	
	1977	1978	1977	1978
April		<10		<10
May	TNTC	83*	4	23*
June	TNTC*	1220*	54*	1850*
July	740*	133	86(?)	150*
August	205*	657	120(?)	97(?)
September	73(?)	120*	40*	170*
October	35		6	
November	17		45	

* Stock visually present.

(?) Stock presence uncertain.

associated with the spring season.

Comments

The 1977 hydrologic year apparently was the more active year for Shenon Creek. Both water and sediment yields were higher, a condition partly attributed to the precipitation regime during the sampling season. The channel bed is often unstable as the stream moves a considerable fine grained bed load. Accurate staff-discharge relationships are difficult to establish. Elevated fecal coliform levels were noted, especially at the Lower station. The Shenon Creek basin is a good candidate for a sample basin that could be intensively monitored in order to evaluate the impact of land management practices upon watershed recovery. Because of the limited number of samples taken and the nature of the hydrochemical parameters evaluated, relationships between the water quality characteristics of Shenon Creek and the Montana Water Quality criteria cannot be addressed.

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Key to Basic Data Record

set -	Initial settings of instrument
inst -	Installation of ppt gages
T -	Trace or Trickle
moved -	Station was moved to a better location
() -	Value questionable
ice -	Station was iced so that sample variable was not obtainable
TNTC -	To numerous to count
u -	Unknown
y -	Yes
N -	No

BASIC DATA RECORD

Station: Lower TaylorLocation: S 19 T 15 R 11WWater Year: 1977Date 1976Time 10/261700Temperature (F°)

air

water

water (max)

water (min)

Precipitation (in)Discharge (cfs)

instant

crest stage

Suspended

sediment (ppm)

Chemical Character

PH

ALK (CaCO₃) (mg/l)

SC (umhos)

TDS (mg/l)

Ca

Mg

Na

K

HCO₃SO₄NH₄NO₃ & NO₂-NPO₄ (Ortho)-PBiological Character

Total Coliform

(colonies/100 mls)

Fecal Coliform

(colonies/100 mls)

Stock present

Stream Reach Score: 75Survey Date: 8/16/76

1977	4/8	4/22	5/14	5/22
2/25	1445	0930	0830	0900
0845				
13	63	54	41	53
32	48	54	40	45
	inst	54	56	59
	inst	36	37	37

2.3	1.0	2.5	1.2	1.0	2.4
ice	6.1	6.2	7.0	1.3	2.7

15	114	34	31	<5	20
222					
204	126	82	194	215	180
133	82	98	126	140	117
		17			
		5.4			
		2.7			
		1.9			
		100			
		5			
		--			
		.10			
		--			

Biological Character

Total Coliform

(colonies/100 mls)

Fecal Coliform

(colonies/100 mls)

Stock present

BASIC DATA RECORD

Station: Lower Taylor
 Location: S 19 T 7S R 11W
 Water Year: 1977

Stream Reach Score: 75Survey Date: 8/16/76

Date 5/30 6/17
 Time 1415 0800

7/15 7/26 8/31 9/20 9/27
 1345 1700 1000 1815 1300

Temperature (F°)

air	61	48	81	73	41	39	66
water	54	46	59	61	43	50	48
water (max)	54	66	64	63	64	59	51
water (min)	39	45	45	49	43	41	41

Precipitation (in)

Discharge (cfs)	2.1	3.1	1.0	1.0	.97	1.0	.97
instant	4.2	4.5	3.1	1.6	1.0	1.1	1.0
crest stage							

Suspended sediment (ppm)

19 16 5 5 23 < 5 < 5

Chemical Character

PH	8.02			8.13	7.65		7.50
ALK (CaCO ₃) (mg/l)	76			104	130		104
SC (µmhos)	157	165	192	188	202	203	198
TDS (mg/l)	102	107	125	122	131	132	129
Ca	22			29	31		36
Mg	5.3			8.6	10		11
Na	2.6			2.9	3.4		3.7
K	1.3			1.4	1.2		1.5
HCO ₃	93			127	158		127
SO ₄	6			7	7		6
NH ₄	--			--	< .01		< .01
NO ₂ & NO ₃ -N	.09			.30	.21		.45
PO ₄ (Ortho)-P	.007			.016	T		.006

Biological Character

Total Coliform (colonies/100 mls)	42	32	53	17	46
Fecal Coliform (colonies/100 mls)	10	22	67	5	47
Stock present		u	u	y	u

BASIC DATA RECORD

Station: <u>Lower Taylor</u>				Stream Reach Score: <u>75</u>			
Location: <u>S 19 T 7S R 11W</u>				Survey Date: <u>8/16/76</u>			
Water Year: <u>1978</u>							
Date	1977	1978	1978	4/14	4/21	4/27	5/6
Time	10/17	11/12	3/21	1145	1115	1630	1000
	1900	1145	1800				
Temperature (F°)							
air	38	48	44	51	36	53	45
water	48	41	50	45	39	51	40
water (max)	53	50	inst	54	45	53	52
water (min)	37	34	inst	36	36	37	38
Precipitation (in)							
Discharge (cfs)							
instant	1.0	1.0	1.3	2.8	4.0	6.8	6.8
crest stage	1.1	1.0	set	6.2	6.2	15	14
Suspended sediment (ppm)	< 5	5	6	20	34	48	23
Chemical Character							
PH	7.80	8.14				6.45	
ALK (CaCO ₃) (mg/l)	105	94				53	
SC (µmhos)	210	193	202	155	131	107	95
TDS (mg/l)	136	125	131	101	85	70	62
Ca	30	27				17	
Mg	10	7.6				3.9	
Na	3.3	2.4				2.5	
K	1.6	0.96				1.4	
HCO ₃	128	114				63	
SO ₄	5	4				4	
NH ₄	.04	<.01				.02	
NO ₃ & NO ₂ -N	.46	.45				.07	
PO ₄ (Ortho)-P	.008	.011				.029	
Biological Character							
Total Coliform (colonies/100 mls)	17	177				1160	
Fecal Coliform (colonies/100 mls)	9	112				10	
Stock present	n	n	n	n	n	n	n

BASIC DATA RECORD

Station: Lower Taylor
 Location: S 19 T 7S R 11W
 Water Year: 1978

Stream Reach Score: 75Survey Date: 8/16/76

Date 5/11 5/26 6/2 6/9 6/15 6/22 7/21 8/15
 Time 1645 1130 1415 1445 1830 1245 1545 1530

Temperature (F°)

air 41 50 66 74 64 64 65 56
 water 44 43 54 61 58 55 51 57
 water (max) 52 -- 57 63 63 61 65 65
 water (min) 39 39 41 47 45 45 47 49

Precipitation (in)

Discharge (cfs)
 instant 7.3 9.1 6.6 6.5 4.5 4.7 3.8 3.5 .95
 crest stage 8.0 11 9.3 7.5 6.5 8.1 4.8 4.0 3.5

Suspended sediment (ppm)

482 32 40 48 167 13 29 36 24

Chemical Character

pH 7.24
 ALK (CaCO₃) (mg/l) 44
 SC (µmhos) 95
 TDS (mg/l) 62
 Ca 13
 Mg 3.1
 Na 2.6
 K 1.2
 HCO₃ 53
 SO₄ 2
 NH₄ .10
 NO₃ & NO₂ -N .02
 PO₄³⁻ (Ortho)-P .024
 7.95 8.15 94 8.15 115 8.55
 83 182 181 118 118 26
 152 99 118 118 23 7.4 7.5 2.7
 1.4 1.5 1.0
 100 115 133 133 6
 4 5
 .02 .03
 .09 .15
 .039 .045 .025

Biological Character

Total Coliform (colonies/100 mls) 880
 Fecal Coliform (colonies/100 mls) 9
 Stock present n y y y y y y y

BASIC DATA RECORD

Station: Lower Taylor
 Location: S 19 T 7S R 11W
 Water Year: 1978

Date 9/15
 Time 1715

Temperature (F°)
 air 65
 water 54
 water (max) 62
 water (min) 44

Precipitation (in)

Discharge (cfs)
 instant 1.4
 crest stage --

Suspended
 sediment (ppm) 20

Chemical Character
 PH 8.21
 ALK (CaCO₃) (mg/l) 96
 SC (umhos) 212
 TDS (mg/l) 138
 Ca " 26
 Mg " 8.5
 Na " 3.2
 K " 1.7
 HCO₃ " 117
 SO₄ " 5
 NH₄ " <.01
 NO₃ & NO₂ -N " .09
 PO₄ (Ortho)-P " .016

Biological Character
 Total Coliform
 (colonies/100 mls) 833
 Fecal Coliform
 (colonies/100 mls) 13
 Stock present u

Stream Reach Score: 75

Survey Date: 8/16/76

BASIC DATA RECORD

Station: <u>Middle Taylor</u>				Stream Reach Score: <u>94</u>			
Location: S <u>8</u> T <u>7S</u> R <u>11W</u>				Survey Date:			
Water Year: <u>1977</u>							
Date	1976	1977					
Time	11/23	4/8					
	0930	1530					
Temperature (F°)							
air	28	72					
water		36					
water (max)		inst					
water (min)		inst					
Precipitation (in)							
Discharge (cfs)							
instant	dry	3.5					
crest stage		set					
Suspended sediment (ppm)							
	388	41					
Chemical Character							
PH							
ALK (CaCO ₃) (mg/l)		7.70					
SC (umhos)		35					
TDS (mg/l)		70					
		46					
Ca							
Mg							
Na							
K							
HCO ₃							
SO ₄							
NH ₄							
NO ₃ & NO ₂ -N							
PO ₄ (Ortho)-P							
Biological Character							
Total Coliform							
(colonies/100 mls)							
Fecal Coliform							
(colonies/100 mls)							
Stock present							

8
< 2

BASIC DATA RECORD

Station: Middle Taylor
 Location: S 8 T 7S R 11W
 Water Year: 1977

Stream Reach Score: 94
 Survey Date: 8/16/76

Date 6/26
 Time 1300

Temperature (F°)
 air 76
 water dry
 water (max)
 water (min)

Precipitation (in)

Discharge (cfs)
 instant
 crest stage

Suspended
 sediment (ppm)

Chemical Character

PH
 ALK (CaCO₃) (mg/l)
 SC (µmhos)
 TDS (mg/l)
 Ca
 Mg
 Na
 K
 HCO₃
 SO₄
 NH₄
 NO₂ & NO₃
 PO₄ (Ortho)

Biological Character
 Total Coliform
 (colonies/100 mls)
 Fecal Coliform
 (colonies/100 mls)
 Stock present

BASIC DATA RECORD

Station: <u>Middle Taylor</u>				Stream Reach Score: <u>94</u>			
Location: S <u>8</u> T <u>7S</u> R <u>11W</u>				Survey Date: <u>8/16/76</u>			
Water Year: <u>1978</u>							
Date	1978	4/7	4/21	4/27	5/6	5/11	5/26
Time	3/29	1000	1245	1845	1215	1800	1030
	1715						
Temperature (F°)							
air	50	32	37	45	50	42	43
water	dry	36	39	46	39	41	41
water (max)		inst	54	51	set	set	59
water (min)		inst	32	34	set	set	32
Precipitation (in)							
Discharge (cfs)							
instant		.73	1.3	9.4	5.0	5.0	7.9
crest stage							4.5
Suspended sediment (ppm)	8	15	33	155	18	42	20
Chemical Character							
PH				6.00			6.60
ALK (CaCO ₃) (mg/l)				28			21
SC (umhos)	71	61	65	58	55	53	51
TDS (mg/l)	46	40	42	38	36	34	33
Ca	"			8.6			7.2
Mg	"			1.7			1.7
Na	"			2.2			2.1
K	"			1.4			1.0
HCO ₃	"			33			25
SO ₄	"			3			2
NH ₄	"			.03			.03
NO ₃ & NO ₂ -N	"			.03			.02
PO ₄ (Ortho)P	"			.008			.026
Biological Character							
Total Coliform (colonies/100 mls)				1120			695
Fecal Coliform (colonies/100 mls)				20			5
Stock present	n	n	n	n	n	n	n
							y

BASIC DATA RECORD

Station: Middle Taylor Stream Reach Score: 94
 Location: S 8 T 7S R 11W Survey Date: 8/16/76
 Water Year: 1978

Date 6/9 6/15 6/22 6/29 7/21 8/15
 Time 0945 1945 1145 0845 1400 1400

Temperature (F°)
 air 68 51 63 64 61 66
 water 54 54 50 50 67 dry
 water (max) 65 65 59 77 73
 water (min) 45 41 40 41 41

Precipitation (in)

Discharge (cfs)
 instant 4.0 1.5 .90 .23 .24
 crest stage

Suspended sediment (ppm)

62 30 38 11 13

Chemical Character

PH 7.55
 ALK (CaCO₃) (mg/l) 35 34 7.44
 SC (umhos) 72 80
 TDS (mg/l) 47 52
 Ca 12 16
 Mg 2.8 5.7
 Na 3.4 3.3
 K 1.4 1.5
 HCO₃ 42 42
 SO₄ 1 5
 NH₄ <.01 .17
 NO₃ <.01 .10
 PO₄ (Ortho)-P .09 .040

Biological Character

Total Coliform 20700 16700
 (colonies/100 mls)
 Fecal Coliform 10900 1400
 (colonies/100 mls)
 Stock present y y u

BASIC DATA RECORD

Station: <u>Upper Taylor</u>				Stream Reach Score: <u>116</u>			
Location: S <u>5</u> T <u>7S</u> R <u>11W</u>				Survey Date: <u>8/16/76</u>			
Water Year: <u>1977</u>							
Date	1976	11/23	1977	4/22	5/14	5/22	6/17
Time	1026	0915	1045	1140	0915	0930	0845
<u>Temperature (F°)</u>							
air	29	16	32	58	51	57	54
water	32	32	32	36	42	45	43
water (max)	43		inst	36	50	48	inst
water (min)	32		inst	32	32	32	inst
<u>Precipitation (in)</u>							
				inst	0.27	n.s.	1.09
<u>Discharge (cfs)</u>							
instant	.65	1.1	2.3	2.0	1.0	2.0	2.1
crest stage	set	2.0	ice	set	2.6	2.8	7.4
<u>Suspended sediment (ppm)</u>							
	8	<5	13	39	<5	26	11
<u>Chemical Character</u>							
PH				7.32			7.12
ALK (CaCO ₃) (mg/l)				20			23
SC (µmhos)	74	80	85	63	62	55	54
TDS (mg/l)	48	52	55	41	40	36	35
Ca	"			6.2		5.9	
Mg	"			2.4		1.6	
Na	"			2.5		2.1	
K	"			2.6		1.0	
HCO ₃	"			24		28	
SO ₄	"			4		6	
NH ₄	"			--		--	
NO ₃ & NO ₂ -N	"			<.01		<.01	
PO ₄ (Ortho) -P	"			--		.024	
<u>Biological Character</u>							
Total Coliform (colonies/100 mls)							2
Fecal Coliform (colonies/100 mls)							<2
Stock present							

BASIC DATA RECORD

Station: <u>Upper Taylor</u>				Stream Reach Score: <u>116</u>		
Location: S <u>5</u> <u>T7S</u> <u>R 11S</u>				Survey Date: <u>8/16/76</u>		
Water Year: <u>1977</u>						
Date	6/26	7/15	7/26	8/31	9/20	9/27
Time	1330	1440	1600	1100	0945	1300
Temperature (F°)						
air	75	76	67	45	40	47
water	59	59	57	43	43	45
water (max)	62	61	64	72	60	48
water (min)	46	43	46	43	37	36
Precipitation (in)	0.47	0.64	1.70	0.60	0.94	0.11
Discharge (cfs)						
instant	.56	.20	.90	.30	.81	.30
crest stage	2.3	1.4	3.9	.90	.81	1.0
Suspended sediment (ppm)	7	< 5	32	8	15	7
Chemical Character						
PH	7.41		7.61	7.35		6.70
ALK (CaCO ₃) (mg/l)	33		37	40		36
SC (umhos)	70	82	75	82	78	86
TDS (mg/l)	46	53	49	53	51	56
Ca	7.0		9.8	9.9		12
Mg	2.4		3.0	3.4		3.7
Na	3.1		3.1	3.9		4.4
K	1.5		1.7	2.3		2.4
HCO ₃	40		45	48		44
SO ₄	4		4	2		3
NH ₄	(.20)		--	<.01		<.01
NO ₃ & NO ₂ -N	<.01		<.01	.09		.07
PO ₄ (Ortho)-P	.036		.046	.008		.030
Biological Character						
Total Coliform (colonies/100 mls)	122		TNTC	1400		24
Fecal Coliform (colonies/100 mls)	126		TNTC	700		34
Stock present	y	u	y	u	u	u

BASIC DATA RECORD

Station: Upper Taylor				Stream Reach Score: 116			
Location: S 5 T 7S R 11W				Survey Date: 8/16/16			
Water Year: 1978							
Date	1977	11/12	1978	4/21	4/27	5/6	5/26
Time	10/17 1830	1200	4/14 0845	1200	1730	1100	0945
Temperature (F°)							
air	46	37	41	34	47	44	39
water	41	33	34	33	46	36	32
water (max)	48	47	inst	41	gone	inst	set
water (min)	32	32	inst	33	gone	inst	set
Precipitation (in)	0.40	> 0.00	inst	0.28	0.47	0.67	0.77
Discharge (cfs)							
instant	.30	ice	2.4	3.5	13	7.4	8.3
crest stage	.46	ice	set	6.0	19	(30)	9.6
Suspended sediment (ppm)	13	16	22	32	296	20	31
Chemical Character							
PH	7.00	6.95			6.10		6.58
ALK (CaCO ₃) (mg/l)	41	30			22		17
SC (µmhos)	87	74	62	55	49	50	46
TDS (mg/l)	57	48	40	36	32	32	30
Ca	11	9.1			6.4		6.0
Mg	3.6	2.9			1.6		1.4
Na	3.9	3.0			2.2		1.9
K	2.1	1.3			1.5		1.0
HCO ₃	50	36			26		20
SO ₄	3	3			3		2
NH ₄	.04	< .01			.03		.02
NO ₃ & NO ₂ -N	.06	.12			.03		.02
PO ₄ (Ortho)-P	.018	.007			.037		.030
Biological Character							
Total Coliform (colonies/100 mls)	34	282		2700			835
Fecal Coliform (colonies/100 mls)	312	103		10			34
Stock present	y	n	n	n	n	n	n

BASIC DATA RECORD

Station: Upper Taylor Stream Reach Score: 116
 Location: S 5 T 7 S R 11W Survey Date: 8/16/76
 Water Year: 1978

Date Time	6/9 0900	6/15 2015	6/22 1215	6/29 0815	7/21 1500	8/15 1430	9/15 1630
Temperature (F°)							
air	63	47	67	60	64	64	59
water	47	50	50	49	54	53	47
water (max)	57	55	53	56	61	63	58
water (min)	39	41	42	42	45	45	39
Precipitation (in)	0.00	0.19	0.40	0.18	1.20	0.61	1.60
Discharge (cfs)							
instant	4.5	2.1	2.3	1.3	.81	.37	.42
crest stage	5.7	4.5	4.1	2.8	1.3	.81	.52
Suspended sediment (ppm)	27	38	41	28	24	23	21
Chemical Character							
PH			7.25		7.14	7.06	7.40
ALK (CaCO ₃) (mg/l)			33		38	45	53
SC (µmhos)	48	58	60	67	75	91	89
TDS (mg/l)	31	38	39	44	49	59	58
Ca			11		8.5	10	9.6
Mg			2.9		3.5	3.0	3.1
Na			3.5		3.6	2.9	3.7
K			1.1		1.3	1.1	2.4
HCO ₃			40		47	55	65
SO ₄			1		2	2	2
NH ₄			.02		.02	.01	<.01
NO ₃ & NO ₂ -N			<.01		.03	.05	.04
PO ₄ (Ortho)-P			.030		.042	0.62	.031

Biological Character

Total Coliform (colonies/100 mls)	483	4060	8800	1870
Fecal Coliform (colonies/100 mls)	17	230	200	217
Stock present	n	n	u	u

BASIC DATA RECORD

Station: Lower East Dyce				Stream Reach Score: (BLM)			
Location: S 26 T 6S R 12W				Survey Date:			
Water Year: 1977							
Date	1976	1977	1977	4/22	5/4	5/14	5/22
Time	10/26	11/23	2/25	1330	1100	1015	1030
	1200	1000	0915				
<u>Temperature (F°)</u>							
air	32	21	21	63	43	63	52
water	36	32	32	48	38	46	48
water (max)	52	43		50	54	55	53
water (min)	32	32		32	35	32	32
<u>Precipitation (in)</u>							
Discharge (cfs)							
instant	1.3	1.4	1.4	2.0	2.0	1.7	1.3
crest stage	set	2.0	ice	2.0	2.2	2.3	1.7
Suspended sediment (ppm)	8	< 5	11	17	14	9	118
<u>Chemical Character</u>							
PH				7.89			
ALK (CaCO ₃) (mg/l)				65			
SC (µmhos)	152	153	120	143	142	148	150
TDS (mg/l)	99	99	78	93	92	96	98
Ca				16			
Mg				6.4			
Na				2.3			
K				1.5			
HCO ₃				79			
SO ₄				3			
NH ₄				--			
NO ₂ & NO ₃ -N				.09			
PO ₄ (Ortho-P)				--			
<u>Biological Character</u>							
Total Coliform							
(colonies/100 mls)							
Fecal Coliform							
(colonies/100 mls)							
Stock present							

BASIC DATA RECORD

Station: Lower East Dyce

Location: S 26 T 6S R 12W

Water Year: 1977

Stream Reach Score: (BLM)

Survey Date:

Date
Time

5/30 6/17
1215 1200

7/15 7/26
1715 1300

8/31 9/20
1500 1700

9/27
1130

Temperature (F°)

air 54 55
water 46 45
water (max) 50 61
water (min) 34 38

79 68
59 56
61 63
41 45

45 46
47 44
57 48
39 36

Precipitation (in)

Discharge (cfs)
Instant
crest stage

2.0 2.3
2.7 4.4

.96
2.0

1.3 1.3
1.3 1.7
1.6 1.6

Suspended
sediment (ppm)

25 35

8 14

7 8 6

Chemical Character

PH
ALK (CaCO₃) (mg/l)
SC (umhos)
TDS (mg/l)

7.64
66 126
134 82
87

7.50
74 144
146 94
95

7.79 7.05
75 81
141 140
92 91

Ca
Mg
Na
K
HCO₃
SO₄

18
5.6
2.0
1.3
80
4

17 18
6.5 7.0
2.0 2.2
1.1 1.2
90 89
3 4

22 23
8.4 8.7
2.8 3.0
1.5 1.6
91 99
3 4

NH₄
NO₂ & NO₃-N
PO₄ (Ortho)-P

--
.36
.041

--
.30
.040

<.01
.26
.026
<.01
.35
.040

Biological Character

Total Coliform
(colonies/100 mls)
Fecal Coliform
(colonies/100 mls)
Stock present

180 294

150

70

14

< 2

254
y

y 216
y

26
y

6
u

BASIC DATA RECORD

Station: Lower East Dyce				Stream Reach Score: (BLM)			
Location: S 26 T 6S R 12W				Survey Date:			
Water Year: 1978							
Date	5/25	6/2	6/9	6/15	6/22	6/28	9/14
Time	1800	1300	1030	1900	0845	1645	2030
Temperature (F°)							
air	46	59	69	52	48	72	39
water	43	47	45	50	42	55	45
water (max)	53	51	55	55	54	55	57
water (min)	36	34	39	38	37	39	40
Precipitation (in)							
Instant	9.1	7.2	7.2	4.9	3.8	3.0	2.4
crest stage	9.1	9.1	7.2	7.8	5.6	3.8	3.2
Suspended sediment (ppm)							
	68	30	37	37	31	21	25
Chemical Character							
PH	7.15						
ALK (CaCO ₃) (mg/l)	41						7.45
SC (umhos)	77	89	76	102	52	128	71
TDS (mg/l)	50	58	49	66	77	83	161
Ca	9.8				18		17
Mg	3.3				6.7		7.3
Na	1.5				2.6		2.8
K	1.0				0.92		2.0
HCO ₃	50				75		86
SO ₄	2				3		2
NH ₄	.01				.02		.01
NO ₂ & NO ₃ -N	.01				.08		.12
PO ₄ (ortho)-P	.030				.005		.026

Biological Character

Total Coliform	3000	2133	767	2120	200
(colonies/100 mls)					
Fecal Coliform	89	37	89	450	70
(colonies/100 mls)					
Stock present	n	n	n	y	y

BASIC DATA RECORD

Station: Lower East Dyce
 Location: S 26 T 6S R 12W
 Water Year: 1978
 Stream Reach Score: (BLM)
 Survey Date: _____

Date	Time	1977	1978	4/7	4/14	4/21	4/28	5/6	5/12
10/17	11/12	1800	1130	1130	1100	1430	1130	1345	1145
1700	1100								

Temperature (F°)	
air	36
water	37
water (max)	48
water (min)	32

Precipitation (In)

<u>Discharge (cfs)</u>				
instant	1.0	1.9	3.2	2.4
crest stage	1.6	1.9	set	3.8
				2.8
				3.0
				3.5
				3.2
				5.3
				3.8
				5.4

Suspended sediment (ppm)	5	13	11	24	35	28	30
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

<u>Chemical Character</u>					
PH	7.49	7.86			6.63
ALK (CaCO_3) (mg/l)	76	76			59
SC (μmhos)	147	133			111
TDS (mg/l)	96	86	128	135	129
			83	88	84
					72
					108
					70
					112
					73

Ca	22	18	15
Mg	7.9	6.6	5.8
Na	2.5	2.0	2.0
K	1.3	0.93	0.98
HCO ₃	93	92	71
SO ₄	3	3	2
NH ₄	.06	<.01	.08
NO ₂ & NO ₃ -N	.22	.27	.09
PO ₄ (Ortho)-P	.033	.015	.016

Biological Character					
Total Coliform					
(colonies/100 mls)	8	TNTC			1020
Fecal Coliform					
(colonies/100 mls)	4	7			< 5
Stock present	n	n	n	n	n

BASIC DATA RECORD

Station: Upper East Dyce
 Location: S 14 T 6S R 12W
 Water Year: 1977

Stream Reach Score: 46Survey Date: 8/17/76

Date
Time

1976	11/23	8/31
10/26	1045	1230

5/14 5/22 5/30 6/26 7/26 8/31
 1115 1100 1000 1000 1000 1230

Temperature (F°)

air	32	30	58	43	50
water	35	34	36	36	45
water (max)	41		inst	43	57
water (min)	32		inst	33	39

Precipitation (in)

Discharge (cfs)	1.0	1.0	1.1	1.5	1.0	1.7
instant	set	--	3.6	1.5	5.1	3.9
crest stage						

Suspended sediment (ppm)

Suspended sediment	10	<5	14	63	8	5	8
--------------------	----	----	----	----	---	---	---

Chemical Character

PH	7.43						
ALK (CaCO ₃) (mg/l)	27				6.78	7.20	7.30
SC (µmhos)	50	30	51	68	22	20	34
TDS (mg/l)	32	20	33	44	41	43	45
Ca	5.9				27	28	29
Mg	2.1				4.3	5.5	5.1
Na	1.5				1.4	1.7	1.8
K	0.86				1.1	1.3	1.2
HCO ₃	33				0.66	0.74	0.80
SO ₄	5				27	24	41
NH ₄ & NO ₃ -N	--				3	3	2
NO ₂	<.01				.14	--	<.01
PO ₄ (Ortho)-P	--				<.01	.03	.06
					.008	.010	T

Biological Character

Total Coliform (colonies/100 mls)	2	39	25
Fecal Coliform (colonies/100 mls)	2	36	<2
Stock present		u	u

BASIC DATA RECORD

Stream Reach Score: 46
 Survey Date: 8/17/76

Station: Upper East Dyce
 Location: S 14 T 6S R 12W
 Water Year: 1977

Date 9/10 9/27
 Time 1300 1030

Temperature (F°)
 air 45 45
 water 44 41
 water (max) 54 46
 water (min) 38 36

Precipitation (in)
 Discharge (cfs)
 instant 1.1 .78
 crest stage 1.9 1.1

Suspended sediment (ppm) 7 <5

Chemical Character
 PH 6.10
 ALK (CaCO₃) (mg/l) (88)
 SC 55
 TDS 36

Ca 5.5
 Mg 2.0
 Na 1.4
 K 0.91
 HCO₃ (107)
 SO₄ 3

NH₄ .01
 NO₃ & NO₂ -N .09
 PO₄ (Ortho)-P .012

Biological Character
 Total Coliform 12
 (colonies/100 mls)
 Fecal Coliform 12
 (colonies/100 mls)
 Stock present u

BASIC DATA RECORD

Station: Upper East Dyce				Stream Reach Score: 46			
Location: S 14 T 6S R 12W				Survey Date: 8/17/76			
Water Year: 1978							
Date	1977	11/12	1978	5/25	6/2	6/9	7/21
Time	10/17	1000	5/12	1700	1230	1145	1045
	1630		1030				
Temperature (F°)							
air	54	36	37	38	54	53	49
water	43	36	35	39	41	43	43
water (max)	46	46	inst	42	48	50	55
water (min)	34	32	inst	32	32	35	40
Precipitation (in)							
Discharge (cfs)		1.0	2.8	3.6	3.9	4.5	1.1
instant		ice	set	4.1	6.2	4.5	2.0
crest stage	1.2						2.0
Suspended sediment (ppm)							
	11	< 5	20	16	21	22	12
Chemical Character							
PH	6.25	6.97		6.35		6.35	7.63
ALK (CaCO ₃) (mg/l)	22	19		13		10	40
SC (μmhos)	52	46	34	28	45	25	72
TDS (mg/l)	34	30	22	18	29	16	47
Ca	5.2	5.0		3.5		6.2	7.3
Mg	1.8	1.7		0.84		1.0	4.0
Na	1.3	1.2		0.80		1.7	1.9
K	0.81	0.68		0.80		0.49	0.71
HCO ₃	27	23		15		12	48
SO ₄	3	2		2		1	2
NH ₄	.07	.04		.01		.02	.03
NO ₂ & NO ₃ -N	.07	.14		< .01		.01	.05
PO ₄ (Ortho)-P	.066	.002		.014		.010	.013
Biological Character							
Total Coliform (colonies/100 mls)	11	69		50		49	59
Fecal Coliform (colonies/100 mls)	2	4		< 1		< 1	5
Stock present	n	n	n	n	n	n	n

BASIC DATA RECORD

Stream Reach Score: 46
 Survey Date: 8/17/76

Station: Upper East Dyce
 Location: S 14 T 6S R 12W
 Water Year: 1978

Date 8/15 9/14
 Time 1030 1830

Temperature (F°)
 air 52 42
 water 44 42
 water (max) 55 51
 water (min) 39 37

Precipitation (in)
 Discharge (cfs)
 instant .78 .88
 crest stage 1.1 2.6

Suspended sediment (ppm)
13 17

Chemical Character
 PH 6.55 6.39
 ALK (CaCO₃) (mg/l) 21 13
 SC (µmhos) 37 50
 TDS (mg/l) 24 32

Ca 4.3 3.1
 Mg 1.4 0.54
 Na 1.2 1.0
 K 0.53 1.0
 HCO₃ 26 16
 SO₄ 2 1
 NH₄ .03 <.01
 NO₃ & NO₂-N .01 <.01
 PO₄ (Ortho)-P .013 .008

Biological Character
 Total Coliform (colonies/100 mls) 655 80
 Fecal Coliform (colonies/100 mls) 3 15
 Stock present u u

BASIC DATA RECORD

Station: Lower West Dyce				Stream Reach Score: (BLM)			
Location: S 26 T 6S R 12W							
Water Year: 1977				Survey Date:			
Date	1976	1977	1977	4/22	5/4	5/14	5/22
Time	10/26	11/23	2/25	1615	1215	1315	1400
Temperature (F°)							
air	32	52	23	60	46	64	50
water	36	32	32	42	37	46	46
water (max)	inst	43	ice	inst	48	52	52
water (min)	inat	32	ice	inst	32	34	32
Precipitation (in)							
Discharge (cfs)							
instant	.67	.60	ice	.34	.22	.25	.15
crest stage	set	.85	ice	set	.34	.25	.25
Suspended sediment (ppm)	15	35	ice	136	25	18	62
Chemical Character							
PH				8.13			
ALK (CaCO ₃) (mg/l)				162			
SC (µmhos)	307	303	187	295	292	321	320
TDS (mg/l)	200	197	122	192	190	209	208
Ca	"			32			
Mg	"			13			
Na	"			4.3			
K	"			2.4			
HCO ₃	"			198			
SO ₄	"			8			
NH ₄	"			--			
NO ₃ & NO ₂ -N	"			.08			
PO ₄ (Ortho)-P	"			--			
Biological Character							
Total Coliform							
(colonies/100 mls)							
Fecal Coliform							
(colonies/100 mls)							
Stock present							

BASIC DATA RECORD

Station: <u>Lower West Dyce</u>				Stream Reach Score: <u>(BLM)</u>			
Location: <u>S 26 T 6S R 12W</u>				Survey Date: _____			
Water Year: <u>1977</u>							
Date	5/30	6/17	6/26	7/15	7/26	8/31	9/27
Time	1200	1200	1130	1700	1230	1530	1030
Temperature (F°)							
air	54	66	72	79	66	57	52
water	41	55	56	57	55	45	40
water (max)	48	60	61	60	53	61	47
water (min)	35	40	44	42	49	40	36
Precipitation (in)							
Discharge (cfs)							
instant	.36	.39	.25	.22	.41	.36	.39*
crest stage	.36	.39	.39	.25	.41	.41	.42
Suspended sediment (ppm)	27	63	8	24	10	71	17
Chemical Character							
PH	7.88		7.99		8.08	7.98	7.62
ALK (CaCO ₃) (mg/l)	169		173		172	168	159
SC (µmhos)	315	310	328	295	283	290	277
TDS (mg/l)	205	202	213	192	184	188	180
Ca	39		38		41	44	48
Mg	14		15		15	18	20
Na	4.2		4.4		4.5	5.3	5.6
K	2.0		1.9		2.2	2.4	2.4
HCO ₃	206		211		210	205	194
SO ₄	7		4		6	6	6
NH ₄	--		.17		--	<.01	.01
NO ₂ & NO ₃ -N	.46		.48		.23	.16	.29
PO ₄ (Ortho)P	.002		.006		.016	T	.010
Biological Character							
Total Coliform (colonies/100 mls)	182		114		122	154	80
Fecal Coliform (colonies/100 mls)	2		86	u	206	96	82
Stock present			y		y	y	y

*moved station

BASIC DATA RECORD

Station: Lower West Dyce
Location: S 26 T 6S R 12W
Water Year: 1978
Stream Reach Score: (BLM)
Survey Date: _____

Date	1977	1978	4/7	4/14	4/21	4/28	5/6	5/12
Time	10/17	3/29	1100	1045	1415	1100	1300	1315
	1700	1815						

Temperature (F°)					
air	44	48	35	50	35
water	34	36	36	38	37
water (max)	49		inst	46	47
water (min)	33		inst	32	32

Precipitation (in)	Discharge (cfs)				
.20	.23	1.4	.78	.63	.74
.28	.30	ice	set	.82	.91
					1.2
					1.8
					1.1
					2.3
					1.6
					1.3

Suspended sediment (ppm)	
7	48
534	35
26	45
15	29

Chemical Character		7.55	7.90	7.83
pH		166	156	158
ALK (CaCO ₃)	(mg/l)	312	290	275
SC	(µmhos)	208	188	179
TDS	(mg/l)		295	322
			192	209
Ca	"	46	42	37
Mg	"	18	18	14
Na	"	5.1	4.7	4.6
K	"	2.1	1.6	1.8
HCO ₃	"	203	190	190
SO ₄	"	6	5	1
NH ₄	"	.04	<.01	.08
NO ₃ & NO ₂ -N	"	.08	.23	.04
PO ₄ (Ortho)-P	"	.007	.010	.009

Biological Character					
Total Coliform					
(colonies/100 mls)	22	385			553
Fecal Coliform					
(colonies/100 mls)	13	3			< 5
Stock present	n	n	n	n	n

BASIC DATA RECORD

Station: Lower West Dyce
 Location: S 26 T 6S R 12W
 Water Year: 1978

Stream Reach Score: (BLM)

Survey Date: _____

Date Time	5/25 1945	6/2 1300	6/9 1330	6/15 1915	6/22 1115	6/28 1900	7/21 1300	8/15 1300	9/14 2015
Temperature (F°)									
air	38	58	70	52	67	68	59	63	39
water	45	49	55	52	49	57	49	51	45
water (max)	55	54	60	57	66	59	60	62	57
water (min)	36	36	42	40	41	41	45	46	41
Precipitation (in)									
Discharge (cfs)									
instant	2.6	2.2	2.1	1.6	1.8	1.2	1.1	.66	.82
crest stage	2.6	2.6	3.4	2.6	3.9	2.8	2.0	1.1	2.3
Suspended sediment (ppm)	72	62	75	63	52	43	65	31	53
Chemical Character									
PH	7.90				8.10		8.05	8.13	8.12
ALK (CaCO ₃) (mg/l)	133				135		148	157	133
SC (µmhos)	250	232	210	235	238	243	280	308	300
TDS (mg/l)	162	151	136	153	155	158	182	200	195
Ca	30				43		31	37	34
Mg	12				13		13	13	13
Na	4.3				6.0		5.3	3.6	4.9
K	1.8				1.4		1.7	1.1	3.0
HCO ₃	160				162		181	192	162
SO ₄	3				5		5	5	5
NH ₄	.01				.02		.03	<.01	.02
NO ₃ & NO ₂ -N	.01				.08		.17	.17	.15
PO ₄ (Ortho)-P	.062				.011		.021	.022	.014

Biological Character

Total Coliform (colonies/100 mls)	609	1980	3330	1140	2730
Fecal Coliform (colonies/100 mls)	59	39	97	223	397
Stock present	n	n	n	y	y

BASIC DATA RECORD

Station: Upper West Dyce		Stream Reach Score: 71	
Location: S 14 T 6S R 12W		Survey Date: 8/17/76	
Water Year: 1977			
Date	1976	4/22	5/14
Time	10/26	1530	1230
	1445	1200	1115
	1977	5/22	5/30
	4/15	1245	1100
	1230		
Temperature (F°)			
air	32	54	63
water	38	37	43
water (max)		39	41
water (min)		41	45
		36	32
Precipitation (in)		inst	0.29
			n.s.
			1.74
			>0.42
Discharge (cfs)			
instant	.37	.37	.29
crest stage	.25	2.9	1.3
			.25
			.75
Suspended sediment (ppm)	8	303	71
	6	12	134
	22		56
Chemical Character			
PH		7.68	7.62
ALK (CaCO ₃) (mg/l)		67	84
SC (umhos)	170	122	164
TDS (mg/l)	110	79	107
		16	24
Ca		4.2	4.7
Mg		3.0	3.6
Na		1.9	1.3
K		82	102
HCO ₃		5	6
SO ₄		--	--
NH ₄		--	--
NO ₂ & NO ₃ -N		<.01	.25
PO ₄ (Ortho)-P		--	.014
			.06
			.29
			.017

Biological Character	
Total Coliform	2
(colonies/100 mls)	1640
Fecal Coliform	<2
(colonies/100 mls)	1600
Stock present	y

BASIC DATA RECORD

Station: Upper West Dyce Stream Reach Score: 71
 Location: S 14 T 6S R 12W Survey Date: 8/17/76
 Water Year: 1977

Date Time	7/15 1615	7/26 1130	8/31 1400	9/20 1430	9/27 1130
Temperature (F°)					
air	73	61	51	41	51
water	54	53	45	46	43
water (max)	59	61	61	55	46
water (min)	36	34	36	36	33
Precipitation (in)	0.97	1.75	1.56	1.64	0.52
Discharge (cfs)					
instant	.16	.29	.29	.29	.29
crest stage	.16	.29	.29	.92	.42

Suspended sediment (ppm)	23	13	6	18	10
Chemical Character					
PH		7.88	7.59		7.31
ALK (CaCO ₃) (mg/l)		92	85		90
SC (umhos)	168	164	173	158	164
TDS (mg/l)	109	107	112	103	107
Ca		26	30		32
Mg		5.8	6.6		7.1
Na		4.3	5.0		5.4
K		1.3	1.5		1.6
HCO ₃		112	110		110
SO ₄		5	4		4
NH ₄		--	<.01		.01
NO ₃ -N		.11	.16		.24
PO ₄ (Ortho)-P		T	T		.004

Biological Character	105	260	900
Total Coliform (colonies/100 mls)			
Fecal Coliform (colonies/100 mls)	107	282	800
Stock present	y	y	n

BASIC DATA RECORD

Station: Upper West Dyce		Stream Reach Score: 71	
Location: S 14 T 6S R 12W		Survey Date: 8/17/76	
Water Year: 1978			
Date	1977	1978	6/28
Time	10/17	4/28	1830
	1630	1000	
	11/12	5/25	6/22
	1000	1900	1030
Temperature (F°)			
air	58	41	51
water	42	38	45
water (max)	50	46	46
water (min)	33	34	36
Precipitation (in)	0.65	1.68	0.44
		inst	0.00
Discharge (cfs)			
instant	.25	.65	1.3
crest stage	.29	1.1	1.5
Suspended sediment (ppm)	11	19	46
		inst	79
		set	38
Chemical Character			
PH	7.20	7.15	7.95
ALK (CaCO ₃) (mg/l)	97	89	86
SC (µmhos)	175	157	149
TDS (mg/l)	114	102	97
Ca	31	25	27
Mg	6.9	5.8	5.8
Na	5.0	4.0	4.4
K	1.4	0.98	1.1
HCO ₃	118	108	103
SO ₄	3	3	3
NH ₄	.03	.08	.02
NO ₃ -N	.25	.11	.05
PO ₄ (Ortho)-P	.006	.004	.090
Biological Character			
Total Coliform (colonies/100 mls)	172	155	933
Fecal Coliform (colonies/100 mls)	96	<5	615
Stock present	n	n	y

Table 1

BASIC DATA RECORD

Station: <u>Upper West Dyce</u>				Stream Reach Score: <u>71</u>	
Location: <u>S 14 T 6S R 12W</u>				Survey Date: <u>8/17/76</u>	
Water Year: <u>1978</u>					
Date	7/21	8/15	9/14		
Time	1215	1215	1945		
Temperature (F°)					
air	52	61	37		
water	46	50	41		
water (max)	59	63	57		
water (min)	41	41	37		
Precipitation (in)	1.58	0.51	2.99		
Discharge (cfs)					
instant	.70	.60	.70		
crest stage	1.7	.86	--		
Suspended sediment (ppm)	8	7	11		
Chemical Character					
PH	7.81	8.13	7.43		
ALK (CaCO ₃) (mg/l)	98	157	81		
SC (µmhos)	172	190	175		
TDS (mg/l)	112	124	114		
Ca	22	25	22		
Mg	5.4	5.1	5.2		
Na	4.8	3.8	4.5		
K	1.2	0.89	1.7		
HCO ₃	120	192	99		
SO ₄	5	4	4		
NH ₄	.04	<.01	<.01		
NO ₂ & NO ₃ -N	.07	.05	.04		
PO ₄ (Ortho)-P	.017	.009	.004		
Biological Character					
Total Coliform (colonies/100 mls)	330	1540	133		
Fecal Coliform (colonies/100 mls)	3	37	13		
Stock present	y	u	u		

BASIC DATA RECORD

Station: <u>Lower Watson</u>				Stream Reach Score: <u>55</u>			
Location: <u>S 11 T 9S R 13W</u>				Survey Date: <u>9/27/76</u>			
Water Year: <u>1977</u>							
Date	1976	11/29	4/8	4/23	5/2	5/13	5/21
Time	10/22	1330	1245	1515	1615	2100	1000
Temperature (F°)							
air	55	34	64	64	50	54	48
water	39	32	41	61	58	53	52
water (max)				65	69	64	66
water (min)				32	34	34	32
Precipitation (in)							
Discharge (cfs)							
instant	.17	ice	ice	.26	.23	.13	.31
crest stage				.49	.36	.27	.80
Suspended sediment (ppm)	20	ice	28	180	37	37	35
Chemical Character							
pH				7.87			
ALK (CaCO ₃) (mg/l)				132			
SC (µmhos)	391	ice	275	410	565	815	600
TDS (mg/l)	254	ice	179	266	367	530	390
Ca	"			31			
Mg	"			12			
Na	"			23			
K	"			6.7			
HCO ₃	"			161			
SO ₄	"			14			
NH ₄	"			--			
NO ₃ & NO ₂ -N	"			4.01			
PO ₄ (Ortho)-P	"			--			
Biological Character							
Total Coliform							
(colonies/100 mls)							
Fecal Coliform							
(colonies/100 mls)							
Stock present							

BASIC DATA RECORD

Station: <u>Lower Watson</u>				Stream Reach Score: <u>55</u>				
Location: S <u>11</u> T <u>9S</u> R <u>13W</u>				Survey Date: <u>9/27/76</u>				
Water Year: <u>1977</u>								
Date	5/28	6/16	6/27	7/15	7/26	8/31	9/26	9/28
Time	1630	1800	1700	1215	1800	1745	1500	1830
Temperature (F°)								
air	46	63	79	72	72	50	54	57
water	57	57	70	63	66	56	55	52
water (max)	61	72	72	72	75	79	72	62
water (min)	37	35	47	45	52	43	37	37
Precipitation (in)								
Discharge (cfs)								
instant	.27	.33	< .10	< .10	< .10	.11	.14	.13
crest stage	.40	.53	.33	< .10	< .10	.11	.14	.14
Suspended sediment (ppm)	6	16	< 5	< 5	< 5	13	< 5	< 5
Chemical Character								
PH	7.85		7.05		7.66	7.70		7.85
ALK (CaCO ₃) (mg/l)	179		237		139	215		155
SC (µmhos)	650	600	800	730	620	520	431	442
TDS (mg/l)	422	390	520	474	403	338	280	287
Ca	62		73		62	53		28
Mg	20		22		19	20		10
Na	44		63		44	32		20
K	7.2		9.9		9.2	15		7.3
HCO ₃	218		290		169	262		190
SO ₄	104		80		147	34		29
NH ₄	--		(.97)		--	< .01		.06
NO ₂ & NO ₃ -N	< .01		< .01		.01	--		.08
PO ₄ (Ortho)-P	.082		.200		.175	.200		.180
Biological Character								
Total Coliform (colonies/100 mls)	< 2		< 2		< 2	4700		1860
Fecal Coliform (colonies/100 mls)	< 2		8		169	2240		2280
Stock present			u	u	u	y	u	u

BASIC DATA RECORD

Station: <u>Lower Watson</u>				Stream Reach Score: <u>55</u>			
Location: S <u>11</u> T <u>9S</u> R <u>13W</u>				Survey Date: <u>9/27/76</u>			
Water Year: <u>1978</u>							
Date	5/11	5/17	5/22	6/3	6/13	6/21	9/14
Time	1500	1630	1830	1330	1730	1030	1615
Temperature (F°)							
air	51	41	53	61	75	68	57
water	51	44	55	62	67	55	56
water (max)	63	68	68	64	73	70	71
water (min)	38	39	46	39	47	45	41
Precipitation (in)							
Discharge (cfs)							
instant	.62	.72	.65	.49	.29	.21	.27
crest stage	.72	.72	.72	.75	.51	.29	.35
Suspended sediment (ppm)							
	24	17	19	23	24	36	24
Chemical Character							
PH		7.25				7.54	8.29
ALK (CaCO ₃) (mg/l)		72				122	104
SC (µmhos)	225	188	225	205	262	270	413
TDS (mg/l)	146	122	146	133	170	176	268
Ca		22				55	42
Mg		5.2				11	12
Na		11				19	24
K		3.0				4.4	8.4
HCO ₃		87				146	127
SO ₄		24				18	54
NH ₄		.02				.04	.04
NO ₃ & NO ₂ -N		<.01				<.01	<.01
PO ₄ (Ortho) -P		.170				.150	.097

Biological Character

Total Coliform (colonies/100 mls)	1020	150000	75000	190000	12500		
Fecal Coliform (colonies/100 mls)	15	10300	3670	433	97		
Stock present	n	y	y	y	u	u	n

BASIC DATA RECORD

Station: Upper Watson
 Location: S 10 T 9S R 13W
 Water Year: 1977

Date 1976
Time 10/22 11/29
1730 1400

Temperature (F°)

air 50 34 28
 water 41 32 32
 water (max) 34
 water (min)

Precipitation (in)Discharge (cfs)

instant .55 .55 ice
 crest stage

Suspended sediment (ppm)

21 13 13

Chemical CharacterPH

ALK (CaCO₃) (mg/l)

SC (µmhos)

TDS (mg/l)

Ca "

Mg "

Na "

K "

HCO₃ "

SO₄ "

NH₄ "

NO₃ & NO₂ -N "

PO₄ (Ortho)-P "

Biological Character

Total Coliform
 (colonies/100 mls)

Fecal Coliform
 (colonies/100 mls)

Stock present

Stream Reach Score: n/a

Survey Date:

4/23 5/2 5/13 5/21
 1500 1615 2045 1100

54 50 54 44
 45 51 46 43
 inst 54 57 56
 inst 34 34 32

inst 0.11 0.33 n.s.

.37 .32 .26
 2.3 .63 .43

.35
 .71

52 20 19 39

7.74

101

295

192

22

7.0

18

6.3

123

27

--

.05

--

BASIC DATA RECORD

Station: Upper Watson		Stream Reach Score: n/a						
Location: S 10 T 9S R 13W		Survey Date:						
Water Year: 1977								
Date	5/28	6/16	6/27	7/15	7/26	8/31	9/26	9/28
Time	1600	1815	1730	1200	1830	1715	1600	1800
Temperature (F°)								
air	46	64	77	72	72	52	54	59
water	50	54	66	61	63	52	52	50
water (max)	54	73	72	72	79	72	68	55
water (min)	38	35	45	43	46	40	36	38
Precipitation (in)	0.61	2.08	0.27	0.65	1.87	0.54	0.87	0.00
Discharge (cfs)								
instant	.21	.20	.10	.10	< .10	.10	.16	.12
crest stage	.21	.37	.20	.10	.10	.10	.27	.16
Suspended sediment (ppm)	19	25	18	52	(123)	30	n.s.	21
Chemical Character								
PH	8.10		8.09		8.11	7.95		8.00
ALK (CaCO ₃) (mg/l)	116		131		124	106		110
SC (µmhos)	345	370	370	341	331	302	305	323
TDS (mg/l)	224	240	240	222	215	196	198	210
Ca	32		36		38	39		42
Mg	6.0		9.3		9.3	11		12
Na	23		27		21	26		31
K	6.9		7.0		8.6	7.8		9.1
HCO ₃	141		160		152	130		134
SO ₄	25		24		28	31		36
NH ₄	--		(3.2)		--	< .01		.11
NO ₃ & NO ₂ -N	.02		< .01		.01	.04		.06
PO ₄ (Ortho)-P	.080		.175		.170	.190		.170
Biological Character								
Total Coliform (colonies/100 mls)	160	228			TNTC	140		43
Fecal Coliform (colonies/100 mls)	70	692			116	110		20
Stock present					u	u		u

BASIC DATA RECORD

Station: Upper Watson			Stream Reach Score: n/a		
Location: S 10 T 9S R 13W			Survey Date:		
Water Year: 1978					
Date	1977	1978	4/21	4/27	5/11
Time	10/16	11/11	0945	1400	1530
	1915	1800			
Temperature (F°)					
air	50	36	35	63	51
water	44	33	36	--	50
water (max)	52	50	54	set	58
water (min)	32	32	32	set	33
Precipitation (in)	0.05	0.19	0.05	0.29	0.56
Discharge (cfs)					
instant	.15	.23	.12	.11	.12
crest stage	.15	.23	.15	.23	.16
Suspended sediment (ppm)	27	24	6	10	5
Chemical Character					
PH	7.45	7.75		7.81	
ALK (CaCO ₃) (mg/l)	109	103		111	
SC (µmhos)	330	328	389	420	354
TDS (mg/l)	214	213	253	273	230
Ca	38	40		44	
Mg	9.0	11		12	
Na	24	24		25	
K	6.1	7.1		6.6	
HCO ₃	133	125		134	
SO ₄	30	31		52	
NH ₄	.08	<.01		.01	
NO ₃ & NO ₂ -N	.07	.08		<.01	
PO ₄ (Ortho) -P	.108	.065		.059	
Biological Character					
Total Coliform	32	262		200	
(colonies/100 mls)					
Fecal Coliform	26	170		10	
(colonies/100 mls)	u	u	n	n	n
Stock present					

BASIC DATA RECORD

Station: <u>Upper Watson</u>					Stream Reach Score: <u>n/a</u>				
Location: S 10 T 9S R 13W					Survey Date:				
Water Year: <u>1978</u>									
Date	5/17	5/22	6/3	6/13	6/21	7/21	8/16	9/14	
Time	1715	1800	1300	1715	1000	1430	1000	1630	
Temperature (F°)									
air	39	55	61	72	64	66	52	57	
water	41	54	51	62	54	59	52	48	
water (max)	53	62	54	68	67	72	68	64	
water (min)	35	37	36	41	41	41	45	41	
Precipitation (in)	> 0.28	1.10	0.44	0.16	0.11	1.34	0.46	1.31	
Discharge (cfs)									
instant	.17	.24	.24	.23	.15	.71	.76	.35	
crest stage	.23	.24	.81	(1.45)	.52	.71	.76	.76	
Suspended sediment (ppm)									
	24	39	19	24	14	16	52	40	
Chemical Character									
PH	7.55				7.60	8.05	7.45	8.05	
ALK (CaCO ₃) (mg/l)	84				92	92	89	104	
SC (µmhos)	278	306	222	180	233	211	200	242	
TDS (mg/l)	181	199	144	117	151	137	130	157	
Ca	28				34	40	22	23	
Mg	7.1				8.0	13	5.5	6.3	
Na	16				14	22	9.7	11	
K	5.0				4.3	3.1	6.9	6.3	
HCO ₃	101				110	113	108	127	
SO ₄	25				18	10	29	9	
NH ₄	.02				.04	.18	.98	.51	
NO ₃ & NO ₂ -N	< .01				< .01	.02	.05	.02	
PO ₄ (Ortho)-P	.078				.150	.123	.202	.124	
Biological Character									
Total Coliform (colonies/100 mls)	1890				4600	8670	467	5300	
Fecal Coliform (colonies/100 mls)	339			u	40	60	97	30	
Stock present	y	y	u	u	n	n	n	n	

BASIC DATA RECORD

Station: Lower North Everson		Stream Reach Score: 76	
Location: S 5 T 11S R 14W		Survey Date: 9/3/76	
Water Year: 1977			
Date	1976	1977	5/20
Time	9/30	2/25	1045
		1315	
Temperature (F°)		4/23	5/13
air	30	0945	1015
water	32		
water (max)		50	58
water (min)		37	42
		42	52
		32	32
Precipitation (in)			
Discharge (cfs)		4/16	
instant	.49	1000	
crest stage	.73		
	set	52	43
		36	39
		inst	54
		inst	32
Suspended sediment (ppm)			
	7	14	
Chemical Character			
PH		17	
ALK (CaCO ₃) (mg/l)		7.80	
SC (µmhos)		84	
TDS (mg/l)	165	155	195
	107	101	127
Ca		16	
Mg		6.6	
Na		4.5	
K		1.7	
HCO ₃		103	
SO ₄		6	
NH ₄		--	
NO ₂ & NO ₃ -N		<.01	
PO ₄ (Ortho)-P		--	

Biological Character

Total Coliform
(colonies/100 mls)

Fecal Coliform
(colonies/100 mls)

Stock present

BASIC DATA RECORD

Station: Lower North Everson
 Location: S 5 T 11S R 14W
 Water Year: 1977

Stream Reach Score: 76
 Survey Date: 9/3/76

Date Time	5/29 1145	6/14 1115	6/27 1100	7/13 0945	7/27 1230	8/30 1215	9/19 2000	9/28 1045
Temperature (F°)								
air	43	57	66	57	70	39	43	54
water	37	49	54	47	61	46	47	45
water (max)	50	63	64	64	68	68	66	57
water (min)	32	32	39	39	45	40	36	32

Precipitation (in)

Discharge (cfs)								
instant	.51	.58	.49	.41	.33	.28	.19	.18
crest stage	.72	.88	1.1	.82	1.1	.35	.28	.37

Suspended
sediment (ppm)

	22	20	29	12	15	77	22	11
--	----	----	----	----	----	----	----	----

Chemical Character

PH	7.73		7.59		7.98	7.81		7.80
ALK (CaCO ₃) (mg/l)	76		74		89	93		102
SC (µmhos)	153	142	147	133	152	190	196	202
TDS (mg/l)	99	92	96	86	99	123	127	131
Ca	19		16		20	24		30
Mg	6.3		6.1		7.5	9.3		12
Na	3.9		3.6		4.5	6.3		7.4
K	1.5		1.5		1.9	3.2		2.2
HCO ₃	92		91		101	113		124
SO ₄	6		4		7	9		7
NH ₄	--		.20		--	.22		.01
NO ₃ & NO ₂ -N	<.01		<.01		.10	.40		.10
PO ₄ (Ortho)-P	--		.028		.060	.092		.044

Biological Character

Total Coliform (colonies/100 mls)	130	840	600			TNTC		380
Fecal Coliform (colonies/100 mls)	80	650	700	u		TNTC	u	420
Stock present								u



BASIC DATA RECORD

Station: Lower North Everson
 Location: S 5 T 11S R 14W
 Water Year: 1978

Stream Reach Score: 76Survey Date: 9/3/76

Date	6/15	6/21	7/1	7/20	8/16	9/14
Time		1030	0900	1000	1115	1015
<u>Temperature (F°)</u>						
air	48	63	57	52	50	46
water	41	45	45	49	48	41
water (max)	55	55	54	64	--	--
water (min)	--	--	36	41	43	38
<u>Precipitation (in)</u>						
<u>Discharge (cfs)</u>						
instant	10	6.0	3.7	1.3	.76	.30
crest stage	17	11	6.3	3.9	2.1	.82
<u>Suspended sediment (ppm)</u>	74	53	33	25	19	32
<u>Chemical Character</u>						
PH		7.20		7.65	7.78	7.28
ALK (CaCO ₃) (mg/l)		52		83	106	94
SC (µmhos)	89	99	138	165	209	215
TDS (mg/l)	58	64	90	107	136	140
Ca		17		17	23	25
Mg		5.4		7.6	8.3	9.5
Na		3.6		5.5	4.5	5.8
K		1.2		1.5	1.3	2.0
HCO ₃		63		100	129	114
SO ₄		4		6	8	9
NH ₄		.06		.03	.01	<.01
NO ₃ -N		.02		.04	.03	.03
PO ₄ (Ortho)-P		.026		.032	.062	.040

Biological Character

Total Coliform	400	3880	417	1730
(colonies/100 mls)				
Fecal Coliform				
(colonies/100 mls)	12	550	283	347
Stock present	n	n	n	n

BASIC DATA RECORD

Station: Upper North Everson
 Location: S 7 T 11S R 14W
 Water Year: 1977

Stream Reach Score: 76
 Survey Date: 9/3/76

Date 1976
Time 9/29

Date 8/30
Time 1130

Temperature (F°)

air 36
 water 32
 water (max) 37
 water (min) 40

5/29 36
 1030 34
 40
 32

6/27 53
 1000 46
 set 57
 set 32

Precipitation (in)

Discharge (cfs)
 instant
 crest stage

.35
 .81
 .38
 .31
 ice

.63
 1.3
 .57
 1.0

.28
 .49

Suspended sediment (ppm)

Chemical Character
 PH

ALK (CaCO₃) (mg/l)
 SC (umhos)
 TDS (mg/l)

8
 128
 83

15
 107
 70

22
 7.38
 52
 102
 66
 10
 5.0
 2.3
 1.1
 63
 3

9
 10
 7.73
 57
 95
 62
 13
 5.8
 2.7
 1.3
 70
 3

Ca
 Mg
 Na
 K
 HCO₃
 SO₄
 NH₄
 NO₃ & NO₂-N
 PO₄ (Ortho)-P

7.42
 53
 102
 66
 13
 5.3
 2.3
 1.2
 65
 3
 --
 .31
 --

7.73
 57
 95
 62
 13
 5.8
 2.7
 1.3
 70
 3
 --
 .04
 .014

7.78
 60
 113
 73
 15
 6.4
 2.1
 1.5
 74
 2
 .02
 .15
 T

Biological Character
 Total Coliform
 (colonies/100 mls)
 Fecal Coliform
 (colonies/100 mls)
 Stock present

< 2
 < 2
 < 3
 50
 y

84
 120
 u
 y

194
 74
 u

BASIC DATA RECORD

Station: Upper North Everson
 Location: S 7 T 11S R 14W
 Water Year: 1977

Stream Reach Score: 76
 Survey Date: 9/3/76

Date 9/19 9/28
 Time 1815 1030

Temperature (F°)
 air 43 48
 water 45 40
 water (max) 57 set
 water (min) 33 set

Precipitation (in)

Discharge (cfs)
 instant .20 .17
 crest stage .28 .31

Suspended sediment (ppm) 9 < 5

Chemical Character
 PH 7.89
 ALK (CaCO₃) (mg/l) 66
 SC (µmhos) 132
 TDS (mg/l) 86

Ca 16
 Mg 7.5
 Na 3.9
 K 1.6
 HCO₃ 81
 SO₄ 3
 NH₄ .01
 NO₃ & NO₂ -N .11
 PO₄ (Ortho) -P .014

Biological Character
 Total Coliform (colonies/100 mls) 9
 Fecal Coliform (colonies/100 mls) 8
 Stock present n n

BASIC DATA RECORD

Station: Upper North Everson
 Location: S 7 T 11S R 14W
 Water Year: 1978

Stream Reach Score: 76
 Survey Date: 9/3/76

Date 1977 11/11
Time 1100 1100

1978
4/26
1715

6/15
1115

6/10
1130

7/1
1000

7/20
1100

Temperature (F°)

air 50
 water 36
 water (max) 46
 water (min) 32

41
34

51
40
 inst inst
 inst inst

45
39
46
34

59
42
48
34

57
42
51
35

48
45
64
39

Precipitation (in)

Discharge (cfs)
 instant .17
 crest stage .20

.78
 set

10
21

7.1
11

3.0
7.1

1.2
4.6

Suspended sediment (ppm)

13

25

25

40

28

20

15

Chemical Character

PH 7.45
 ALK (CaCO₃) (mg/l) 64
 SC (umhos) 130
 TDS (mg/l) 84

6.73
59
104
68

6.82
47
93
60

65
42

7.21
33
72
47

90
58

7.35
53
105
68

Ca 18

17

12

17

13

13

13

13

Mg 7.6

7.5

5.6

5.5

4.3

4.3

5.1

5.1

Na 3.6

3.5

2.7

3.3

2.7

2.7

3.4

3.4

K 1.3

1.4

1.1

1.4

0.92

0.92

1.1

1.1

HCO₃ 78

79

71

56

46

46

65

65

SO₄ 3

3

2

2

1

1

2

2

NH₄ & NO₃-N .04

.26

.10

.02

.02

.02

.04

.04

PO₄ (ortho)-P .018

.018

.019

.07

.015

.015

.042

.042

Biological Character

Total Coliform 40
 (colonies/100 mls)
 Fecal Coliform 27
 (colonies/100 mls)
 Stock present n

555

n.s.

170

< 1

n

263

Stock present n

--

n.s.

n

< 1

n

78

y

BASIC DATA RECORD

Stream Reach Score: 76
 Survey Date: 9/3/76

Station: Upper North Everson
 Location: S 7 T 11S R 14W
 Water Year: 1978

Date 8/16 9/14
Time 1015 1115

Temperature (F°)
 air 46 43
 water 44 38
 water (max) 58 56
 water (min) 39 35

Precipitation (in)
 Discharge (cfs)
 instant .54 .44
 crest stage 1.2 .59

Suspended
 sediment (ppm) -- 18

Chemical Character
 PH 7.63 6.70
 ALK (CaCO₃) (mg/l) 66 62
 SC (μ mhos) 128 128
 TDS (mg/l) 83 83
 Ca " 13 14
 Mg " 5.7 6.3
 Na " 4.1 3.4
 K " 1.0 1.8
 HCO₃ " 80 76
 SO₄ " 2 3
 NH₄ " <.01 <.01
 NO₂ & NO₃-N " .02 <.01
 PO₄ (Ortho)-P " .022 .012

Biological Character
 Total Coliform 190 200
 (colonies/100 mls)
 Fecal Coliform 73 143
 (colonies/100 mls)
 Stock present y y

BASIC DATA RECORD

Station: South EversonLocation: S 8 T 11S R 14WWater Year: 1977Stream Reach Score: 74Survey Date: 9/3/76Date
Time1976
9/3010/23
140011/22
09151977
2/25
13454/16
10454/23
10155/3
10155/13
13005/20
143041
6037
5048
5432
340.23
0.80

1.07

.28
set.31
ice.30
ice.36
ice.41
set1.2
1.215
14

204

7.90

120

246

160

235

153

247

161

282

183

25

11

6.5

2.7

147

15

--

.13

--

Biological Character

Total Coliform

(colonies/100 mls)

Fecal Coliform

(colonies/100 mls)

Stock present

Chemical Character

PH

ALK (CaCO₃) (mg/l)

SC (umhos)

TDS (mg/l)

Ca

Mg

Na

K

HCO₃SO₄NH₄NO₃-NPO₄ (Ortho)-P

BASIC DATA RECORD

Station: <u>South Everson</u>									
Location: <u>S 8 T 11S R 14W</u>									
Water Year: <u>1977</u>									
Stream Reach Score: <u>74</u>									
Survey Date: <u>9/3/76</u>									
Date	5/29	6/14	6/27	7/13	7/27	8/30	9/19	9/28	
Time	1215	1145	1200	1200	1330	1200	1700	1115	
Temperature (F°)									
air	46	57	68	66	72	41	59	61	
water	41	52	57	58	63	54	50	46	
water (max)	52	inst	64	64	63	77	70	54	
water (min)	32	inst	52	55	48	40	36	34	
Precipitation (in)	1.10	>1.56	1.32	n.s.	n.s.	4.95	0.93	0.47	
Discharge (cfs)									
instant	.36	.52	.24	.22	.26	.22	.20	.22	
crest stage	.58	.87	.52	.79	.96	.26	.22	.24	
Suspended sediment (ppm)	33	55	33	27	2790*	9	15	11	
Chemical Character									
PH	7.80		7.89		8.02	8.20		8.00	
ALK (CaCO ₃) (mg/l)	111		129		123	148		149	
SC (µmhos)	245	220	278	262	238	308	302	313	
TDS (mg/l)	159	143	181	170	155	200	196	203	
Ca	29		(8.9)		33	43		39	
Mg	9.4		8.5		12	20		20	
Na	5.7		5.9		5.9	9.3		9.3	
K	2.3		2.1		2.9	2.8		2.7	
HCO ₃	140		158		150	180		182	
SO ₄	13		12		14	24		25	
NH ₄	--		.16		--	.01		.03	
NO ₂ & NO ₃ -N	.30		.12		.31	.20		.05	
PO ₄ (Ortho)-P	.025		.038		.087	.094		.066	
Biological Character									
Total Coliform (colonies/100 mls)	880		3920		3500	8200		400	
Fecal Coliform (colonies/100 mls)	800		3730		3380	7200		250	
Stock present			u	y	y	u	u	y	

*attributed to stock near station

BASIC DATA RECORD

Station: South Everson
Location: S 8 T 11S R 14W
Water Year: 1978
Stream Reach Score: 74
Survey Date: 9/3/76

Water Year, 1978	
Date	Time
1977	
10/16	1200
11/11	1200
4/20	1045
4/26	1845
5/5	1045
5/11	1030
5/25	1200
6/1	1800
6/10	1215

Temperature (F°)						
air	63	37	49	43	32	33
water	46	32	42	47	34	37
water (max)	dry	49	inst	56	55	51
water (min)	dry	32	inst	32	32	34

Precipitation (in)	0.57	0.73		
Discharge (cfs)				
instant	.26	.27	.56	9.7
crest stage	.26	ice set		1.2
				.32
				.79
				.87
				2.1
				(6.2)
				1.8
				6.2
				5.1
				6.8

Suspended sediment (ppm)	< 5	15	14	75	51	38	75	74	418
--------------------------	-----	----	----	----	----	----	----	----	-----

Chemical Character		7.60	7.55	7.61	7.41	7.88	
PH		144	132	114		87	
ALK (CaCO ₃) (mg/l)		288	312	218	208	170	108
SC (µmhos)		187	203	142	135	110	70
TDS (mg/l)							
Ca	"	42	42	25		20	
Mg	"	17	18	10		7.6	
Na	"	8.8	9.1	5.7		4.4	
K	"	2.2	2.1	2.0		1.8	
HCO ₃	"	176	161	137		104	
SO ₄	"	23	11	7		6	
NH ₄	"	.04	<.01	<.01		.01	
NO ₃ & NO ₂ -N	"	.03	.08	.05		.14	
PO ₄ (Ortho)-P	"	.046	.031	.051		.034	

Biological Character				
Total Coliform	30	71	1140	773
(colonies/100 mls)				
Fecal Coliform	50	35	--	29
(colonies/100 mls)				
Stock present	u	n	n	n

BASIC DATA RECORD

Station: South Everson Stream Reach Score: 74
 Location: S 8 T 11S R 14W Survey Date: 9/3/76
 Water Year: 1978

Date Time	6/15 1215	6/21 1245	7/1 1100	7/20 1215	8/16 1215	9/14 1245
Temperature (F°)						
air	57	64	64	54	53	51
water	45	47	49	52	50	45
water (max)	51	52	57	61	64	64
water (min)	36	36	37	44	43	39
Precipitation (in)	inst	0.22	0.45	> 0.50	> 0.32	2.38
Discharge (cfs)						
instant	2.8	1.8	1.7	.87	.41	.46
crest stage	7.4	2.8	3.1	2.8	.87	1.0
Suspended sediment (ppm)	121	.68	68	27	27	80
Chemical Character						
PH						
ALK (CaCO ₃) (mg/l)		7.65		7.98	7.95	7.54
SC (µmhos)	108	61		94	121	104
TDS (mg/l)	70	120	158	201	245	259
		78	103	131	159	168
Ca		25		14	29	28
Mg		6.7		9.3	11	12
Na		4.8		5.5	4.7	5.6
K		1.5		2.0	1.4	2.8
HCO ₃		73		115	147	126
SO ₄		5		7	10	11
NH ₄		.04		< .01	< .01	< .01
NO ₃ -N		.04		.07	.06	.05
PO ₄ (Ortho)-P		.030		.046	.071	.060

Biological Character

Total Coliform (colonies/100 mls)	1030	3330	833	26100
Fecal Coliform (colonies/100 mls)	14	447	453	6150
Stock present	n	y	y	y

Table 1

BASIC DATA RECORD

Station: Lower Black Canyon		Stream Reach Score: 86	
Location: S 21 T 11S R 14W		Survey Date: 9/1/76	
Water Year: 1977			
Date	1976	1977	5/20
Time	9/29	2/25	5/13
		1445	1200
	10/23	4/16	5/3
	1615	1445	1130
Temperature (F°)		4/22	5/13
air	36	1320	1200
water	37	57	35
water (max)		37	38
water (min)		inst	46
		inst	34
Precipitation (in)			
Discharge (cfs)			
Instant	2.9	3.1	1.3
crest stage		2.7	2.5
		4.4	4.1
Suspended sediment (ppm)			
		9	5
Chemical Character			
PH			7.71
ALK (CaCO ₃) (mg/l)			80
SC (µmhos)	180	185	160
TDS (mg/l)	117	120	104
Ca			16
Mg			8.0
Na			3.3
K			1.4
HCO ₃			98
SO ₄			6
NH ₄			--
NO ₂ & NO ₃ -N			.08
PO ₄ (Ortho)-P			--
Biological Character			
Total Coliform			
(colonies/100 mls)			
Fecal Coliform			
(colonies/100 mls)			
Stock present			

Table 1

BASIC DATA RECORD

Station: <u>Lower Black Canyon</u>				Stream Reach Score: <u>86</u>			
Location: <u>S 21 T 11S R 14W</u>				Survey Date: _____			
Water Year: <u>1977</u>							
<u>Date</u>	<u>5/29</u>	<u>6/14</u>	<u>6/27</u>	<u>7/13</u>	<u>7/27</u>	<u>8/30</u>	<u>9/19</u>
<u>Time</u>	<u>1630</u>	<u>1330</u>	<u>1400</u>	<u>1600</u>	<u>1700</u>	<u>1530</u>	<u>1330</u>
<u>Temperature (F°)</u>							
air	51	66	72	70	70	39	62
water	44	50	55	56	59	48	47
water (max)	48	56	60	58	59	60	55
water (min)	34	35	36	47	50	45	42
<u>Precipitation (in)</u>							
<u>Discharge (cfs)</u>							
instant	2.1	5.2	2.7	1.6	1.7	.98	1.1
crest stage	3.9	6.5	6.2	6.5	8.2	1.8	1.3
<u>Suspended sediment (ppm)</u>	6	12	948*	8	20	9	< 5
<u>Chemical Character</u>							
PH			7.44		7.82	7.68	7.61
ALK (CaCO ₃) (mg/l)			66		78	88	101
SC (µmhos)	153	112	130	139	142	166	158
TDS (mg/l)	99	73	84	90	92	108	103
Ca			16		19	23	24
Mg			6.1		7.9	9.6	11
Na			2.7		3.1	4.7	4.6
K			1.0		1.2	3.1	1.7
HCO ₃			80		96	107	123
SO ₄			3		5	5	5
NH ₄			.29		--	.01	.01
NO ₃ & NO ₂ -N			< .01		.04	.07	.06
PO ₄ (Ortho)-P			.004		.022	.014	.018

Biological Character

<u>Total Coliform</u> (colonies/100 mls)	316	100	52	21
<u>Fecal Coliform</u> (colonies/100 mls)	292	91	46	11
<u>Stock present</u>	y	y	y	y

BASIC DATA RECORD

Station: <u>Lower Black Canyon</u>				Stream Reach Score: <u>86</u>			
Location: S <u>21</u> T <u>11S</u> R <u>14W</u>				Survey Date: <u>9/1/76</u>			
Water Year: <u>1978</u>							
Date	1977	1978	1978	4/27	5/5	5/25	6/1
Time	10/16	11/11	4/6	1445	1300	1230	2015
	1345	1330	1530				
<u>Temperature (F°)</u>							
air	63	37	46	46	30	40	47
water	43	35	38	40	34	38	45
water (max)	50	45	inst	42	45	--	50
water (min)	35	33	inst	33	32	--	33
<u>Precipitation (in)</u>							
instant	1.2	1.1	2.0	2.6	1.3	18	15
crest stage	1.5	2.8	set	3.1	3.7	22	21
<u>Suspended sediment (ppm)</u>							
	< 5	9	15	10	14	35	30
<u>Chemical Character</u>							
PH	7.40	7.30		7.00		7.60	
ALK (CaCO ₃) (mg/l)	90	82		85		57	
SC (µmhos)	165	165	166	155	147	103	109
TDS (mg/l)	107	107	108	101	96	67	71
Ca	25	24		19		12	
Mg	10	10		8.8		5.1	
Na	4.0	4.1		3.2		2.5	
K	1.2	1.2		0.95		1.0	
HCO ₃	110	99		102		68	
SO ₄	5.7	4.8		2		3	
NH ₄	.10	.02		<.01		.01	
NO ₃ & NO ₂ -N	.08	.06		<.01		.02	
PO ₄ (Ortho)-P	.011	.002		.009		.021	
<u>Biological Character</u>							
Total Coliform (colonies/100 mls)	18	77		150		620	
Fecal Coliform (colonies/100 mls)	10	8		<10		5	
Stock present	n	n	n	n	n	n	n

BASIC DATA RECORD

Station: Lower Black CanyonStream Reach Score: 86Location: S 21 T 11S R 14WSurvey Date: 9/1/76Water Year: 1978

Date	6/10	6/15	6/21	7/1	7/20	8/16	9/14
Time	1515	1500	1445	1400	1430	1500	1445

Temperature (F°)

air	45	55	68	66	52	39	53
water	43	45	49	51	50	48	46
water (max)	52	57	53	56	59	60	56
water (min)	37	36	36	39	43	45	41

Precipitation (in)

Discharge (cfs)	54	33	21	15	5.1	3.6	3.6
instant	57	55	34	24	15	5.6	3.8
crest stage							

Suspended sediment (ppm)	55	41	32	30	29	21	28
--------------------------	----	----	----	----	----	----	----

Chemical Character

PH			7.30		7.65	7.68	7.60
ALK (CaCO ₃) (mg/l)			41		58	83	89
SC (µmbos)	65	70	80	102	136	167	173
TDS (mg/l)	42	46	52	66	88	109	112
Ca			17		15	17	18
Mg			5.2		6.5	7.6	8.3
Na			3.4		3.2	3.0	3.7
K			1.0		1.1	1.0	1.9
HCO ₃			49		83	102	109
SO ₄			1		2	3	2
NH ₄			.01		.06	<.01	.09
NO ₂ & NO ₃ -N			.01		.02	.04	<.01
PO ₄ (Ortho)-P			.017		.036	.013	.017

Biological Character

Total Coliform (colonies/100 mls)			730		1480	3020	467
Fecal Coliform (colonies/100 mls)			93		89	241	175
Stock present	n	y	y	y	y	y	u

BASIC DATA RECORD

Station: Upper Black Canyon
 Location: S 19 T 11S R 14W
 Water Year: 1977

Stream Reach Score: 86Survey Date: 9/1/76

Date Time	7/13 1500	7/27 1600	8/30 1500	9/19 1445	9/28 1300
Temperature (F°)					
air	66	66	42	54	49
water	50	55	46	45	42
water (max)	54	57	inst	53	46
water (min)	39	43	inst	37	34

Precipitation (in)

Discharge (cfs)	7/13 1500	7/27 1600	8/30 1500	9/19 1445	9/28 1300
instant	2.2	1.9	1.6	1.4	1.1
crest stage	8.6	7.4	3.4	2.1	2.2

Suspended
sediment (ppm)

Suspended sediment (ppm)	7/13 1500	7/27 1600	8/30 1500	9/19 1445	9/28 1300
	< 5	16	< 5	10	12

Chemical Character

Chemical Character	7/13 1500	7/27 1600	8/30 1500	9/19 1445	9/28 1300
PH		7.90	7.51		7.58
ALK (CaCO ₃) (mg/l)		69	77		80
SC (µmhos)	115	128	144	142	153
TDS (mg/l)	75	83	94	92	99
Ca		16	19		20
Mg		6.9	8.6		10
Na		2.6	2.1		3.8
K		1.1	1.3		1.4
HCO ₃		84	94		98
SO ₄		3	2		4
NH ₄		--	.02		.01
NO ₂ & NO ₃ -N		.04	.13		.12
PO ₄ (Ortho) -P		.013	T		.013

Biological Character

Biological Character	7/13 1500	7/27 1600	8/30 1500	9/19 1445	9/28 1300
Total Coliform (colonies/100 mls)		149	420		4
Fecal Coliform (colonies/100 mls)		71	266		3
Stock present	u	u	u	u	n

BASIC DATA RECORD

Station: Upper Black Canyon
 Location: S 19 T 11S R 14W
 Water Year: 1978

Stream Reach Score: 86

Survey Date: 9/1/76

Date 1977
Time 10/16 11/11
1330 1330

1978
4/20
1230

6/10
1415

6/15
1400

6/21
1350

7/1
1230

Temperature (F°)

air 63 34
 water 33 32
 water (max) 46 37
 water (min) 32 32

36
37
inst
inst

47
41
47
32

55
45
48
36

64
47
49
37

65
49
54
38

Precipitation (in)

Discharge (cfs)
 instant 1.1 ice
 crest stage 1.1 ice

1.9
set

2.2
2.7

13
17

32
45

17
32

11
19

Suspended sediment (ppm)

< 5 15

15

10

23

45

28

17

Chemical Character

PH 7.75 7.25
 ALK (CaCO₃) (mg/l) 78 80
 SC 152 146
 TDS 99 95
 Ca 21 20
 Mg 9.1 9.1
 Na 3.5 3.3
 K 1.1 0.96
 HCO₃ 96 97
 SO₄ 3 2
 NH₄ .04 <.01
 NO₃ .23 .08
 PO₄ .003 .001

7.10

6.93

52
94
61

18
5.8
3.1
1.1
63
2

.01
.06
.019

7.20
37
(70)
(46)
22
7.8
4.4
1.5
44
1
.01
.02
.014

Biological Character

Total Coliform
 (colonies/100 mls)
 Fecal Coliform
 (colonies/100 mls)
 Stock present

5 82

125

n.s.

123

< 1
n

n

BASIC DATA RECORD

Station: Upper Black Canyon
 Location: S 19 T 11S R 14W
 Water Year: 1978
 Stream Reach Score: 86
 Survey Date: 9/1/76

Date	7/20	8/16	9/14
Time	1915	1400	1345
Temperature (F°)			
air	46	50	49
water	47	48	41
water (max)	55	57	--
water (min)	43	43	--
Precipitation (in)			
Discharge (cfs)			
instant	5.7	3.5	3.4
crest stage	11	5.7	5.5
Suspended sediment (ppm)	13	14	9
Chemical Character			
PH	7.34	7.56	7.29
ALK (CaCO ₃) (mg/l)	52	77	71
SC (µmhos)	105	142	155
TDS (mg/l)	68	92	101
Ca	14	19	16
Mg	6.0	8.0	7.9
Na	2.8	3.0	3.4
K	0.98	1.0	1.7
HCO ₃	75	94	87
SO ₄	2	2	2
NH ₄	.03	.03	(.68)
NO ₂ & NO ₃ -N	.05	.02	.03
PO ₄ (Ortho)-P	.014	.026	.007

Biological Character

Total Coliform	700	973	383
(colonies/100 mls)			
Fecal Coliform	86	161	197
(colonies/100 mls)	u	y	u
Stock present			

Station: Lower Nip & Tuck
 Location: S 26 T 11S R 14W
 Survey Year: 1977
 Stream Reach Score: 94
 Survey Date: 9/1/76

[illegible]

Temperature (F°)						
air	41	41	46	64	44	64
water	32	32	43	50	44	48
water (max)			inst	50	57	54
water (min)			inst	32	32	32
						51
						46
						58
						33

Precipitation (in)					
Discharge (cfs)					
instant	1.6	1.9	2.0	1.4	1.9
crest stage		set	ice	set	3.1
					1.2
					3.4
					1.4
					1.8
					1.7
					1.1
					2.6

Suspended sediment (ppm)	19	251	148	45	62	26	28
--------------------------	----	-----	-----	----	----	----	----

Chemical Character		7.79	7.
PH		71	77
ALK (CaCO ₃) (mg/l)			
SC (umhos)	174	142	163
TDS (mg/l)	113	92	106

Ca	"	15	22
Mg	"	4.6	5.7
Na	"	3.6	3.0
K	"	2.8	1.8
HCO ₃	"	86	96
SO ₄	"	4	4
NH ₄	"	--	--
NO ₃ & NO ₂ -N	"	<.01	<.01
PO ₄ (Ortho)-P	"	--	--

Biological Character	
Total Coliform (colonies/100 mls)	4
Fecal Coliform (colonies/100 mls)	< 2
Stock present	

BASIC DATA RECORD

Station: <u>Lower Nip & Tuck</u>				Stream Reach Score: <u>94</u>			
Location: S <u>26</u> T <u>11S</u> R <u>14W</u>				Survey Date: <u>9/1/76</u>			
Water Year: <u>1977</u>							
Date	6/16	6/28	7/14	7/27	8/30	9/18	9/28
Time	1230	1045	1750	1115	1130	1245	1430
Temperature (F°)							
air	55	65	72	62	52	53	61
water	56	52	70	59	50	50	52
water (max)	73	69	73	72	75	68	62
water (min)	37	38	39	46	39	37	32
Precipitation (in)							
Discharge (cfs)							
instant	1.3	.86	.70	.92	.58	.54	.54
crest stage	2.3	2.0	2.4	.92	.92	.92	.96
Suspended sediment (ppm)	40	27	10	19	10	32	< 5
Chemical Character							
PH		7.64		8.04	7.91		8.39
ALK (CaCO ₃) (mg/l)		90		84	90		84
SC (µmhos)	153	175	159	153	165	167	167
TDS (mg/l)	99	114	103	99	107	109	109
Ca		22		23	27	29	29
Mg		5.8		6.2	6.8	7.3	7.3
Na		4.3		4.1	5.0	5.7	5.7
K		1.7		1.9	2.1	2.5	2.5
HCO ₃		110		102	110	95	95
SO ₄		3		5	4	3	3
NH ₄		.11		--	<.01	.06	.06
NO ₃ & NO ₂ -N		<.01		.03	.05	.09	.09
PO ₄ (Ortho)-P		.053		.090	.073	.083	.083

Biological Character

Total Coliform (colonies/100 mls)	177	1240	2200	803
Fecal Coliform (colonies/100 mls)	< 1	1600	1200	760
Stock present	u	y	y	y

BASIC DATA RECORD

Station: Lower Nip & Tuck
 Location: S 26 T 11S R 14W
 Water Year: 1978

Stream Reach Score: 94
 Survey Date: 9/1/76

Date 1977
Time
 10/16 11/11
 1500 1415

1978
 4/6 4/20 4/27 5/5 5/11 5/25
 1430 1600 1100 1330 1200 1200

Temperature (F°)

air 57 46
 water 54 34
 water (max) 56 55
 water (min) 32 32

42 43 42 33 38 36
 41 45 41 33 42 39
 53 54 53 55 54 61
 32 34 32 33 34 34

Precipitation (in)

Discharge (cfs)
 instant .66 ice
 crest stage 1.4 ice

.88
 set

1.2 1.8
 2.1

.96 .54
 1.7 2.2

4.1 2.3
 8.8 3.7

Suspended sediment (ppm)

10 11

31

40

43

102

130

Chemical Character

PH 8.01 8.20

ALK (CaCO₃) (mg/l)

81 75

SC (μmhos)

162 150

TDS (mg/l)

105 98

Ca "

26 25

Mg "

6.5 8.0

Na "

5.1 4.6

K "

1.9 1.6

HCO₃ "

95 92

SO₄ "

3 3

NH₄ "

.05 <.01

NO₃ & NO₂ -N "

.08 .09

PO₄ (Ortho)-P "

.060 .047

7.69

81

142

92

21

6.1

3.0

0.82

98

2

.01

.04

.050

7.30

57

108

70

14

4.1

3.1

1.4

69

2

.02

.07

.049

Biological Character

Total Coliform

(colonies/100 mls)

Fecal Coliform

(colonies/100 mls)

Stock present

230 488

150 325

n n

720

10

n n

923

16

n n

BASIC DATA RECORD

Station: Lower Nip & Tuck
 Location: S 26 T 11S R 14W
 Water Year: 1978

Stream Reach Score: 94Survey Date: 9/1/76

Date	6/1	6/10	6/15	6/21	7/1	7/20	8/16	9/13
Time	1230	1800	1715	1700	1600	2015	1415	1130
Temperature (F°)								
air	46	36	58	51	51	46	53	42
water	46	48	57	54	59	54	54	45
water (max)	61	63	57	59	67	72	73	69
water (min)	34	36	39	39	39	44	43	39
Precipitation (in)								
Discharge (cfs)								
instant	4.4	12	5.2	3.7	1.8	1.2	.73	.80
crest stage	7.0	12	12	6.3	4.6	3.2	1.5	>.80
Suspended sediment (ppm)	74	228	139	89	45	46	25	20
Chemical Character								
PH				7.63		7.78	8.25	7.85
ALK (CaCO ₃) (mg/l)				54		79	99	81
SC (µmhos)	105	82	98	107	138	155	177	174
TDS (mg/l)	68	53	64	70	90	101	115	113
Ca				20		23	20	20
Mg				5.2		6.0	6.3	6.8
Na				3.9		3.9	3.6	4.2
K				1.2		1.5	1.4	2.1
HCO ₃				65		97	121	99
SO ₄				4		2	3	2
NH ₄				.21		<.01	.06	<.01
NO ₃ & NO ₂ -N				.02		.02	.01	.05
PO ₄ (Ortho)-P				.042		.061	.068	.065

Biological Character

Total Coliform
 (colonies/100 mls)
 Fecal Coliform
 (colonies/100 mls)
 Stock present

2880	15400	1730	> 20000
117	545	667	267
n	n	n	y

BASIC DATA RECORD

Station: Upper Nip & Tuck
 Location: S 33 T 11 S R 14 W
 Water Year: 1977

Stream Reach Score: 94Survey Date: 9/1/76

Date 1976
Time 9/26 10/24 11/22 5/13 5/20 5/30 6/16 6/28
1200 1130 1645 1845 0930 1130 1000

Temperature (F°)

air 39
 water 38
 water (max) inst
 water (min) inst

Precipitation (in)

Discharge (cfs)
 instant 1.0 1.3 1.0
 crest stage 2.5

Suspended sediment (ppm)Chemical Character

PH 7.55
 ALK (CaCO₃) (mg/l) 71
 SC (umhos) 137
 TDS (mg/l) 89
 Ca 14
 Mg 6.1
 Na 3.0
 K 1.3
 HCO₃ 87
 SO₄ 4
 NH₄ "
 NO₃ & NO₂ -N "
 PO₄ (Ortho)-P "

Biological Character

Total Coliform
 (colonies/100 mls) 8
Fecal Coliform
 (colonies/100 mls) < 2
Stock present

8

< 2

560

542

u

BASIC DATA RECORD

Station: Upper Nip & Tuck
 Location: S 33 T 11S R 14W
 Water Year: 1977
 Stream Reach Score: 94
 Survey Date: 9/1/76

Date	7/14	7/27	8/30	9/18	9/28
Time	1700	1030	1030	1130	1445
Temperature (F°)					
air	70	55	54	45	55
water	66	53	48	43	50
water (max)	69	69	70	64	55
water (min)	38	45	39	36	34
Precipitation (in)					
Discharge (cfs)					
instant	.43	.65	.43	.54	.43
crest stage	1.2	.87	.68	.75	.68
Suspended sediment (ppm)	< 5	< 5	< 5	14	8
Chemical Character					
PH		7.69	7.80		7.91
ALK (CaCO ₃) (mg/l)		81	88		83
SC (µmhos)	151	147	161	158	163
TDS (mg/l)	98	96	105	103	106
Ca	"	20	22		24
Mg	"	7.7	8.7		9.4
Na	"	3.4	3.9		4.7
K	"	1.2	1.4		1.5
HCO ₃	"	99	107		102
SO ₄	"	4	3		4
NH ₄	"	--	<.01		.01
NO ₂ & NO ₃ -N	"	.12	.15		.14
PO ₄ (Ortho)-P	"	.066	.053		.054

Biological Character

Total Coliform (colonies/100 mls)	1240	440	1000
Fecal Coliform (colonies/100 mls)	1180	460	660
Stock present	u	y	u

BASIC DATA RECORD

Station: <u>Upper Nip & Tuck</u>		Stream Reach Score: <u>94</u>	
Location: <u>S 33 T 11S R 14W</u>		Survey Date: <u>9/1/76</u>	
Water Year: <u>1978</u>			
Date	1977	1978	
Time	10/16	4/20	7/20
	1430	1500	2100
Temperature (F°)			
air	59	39	54
water	48	40	50
water (max)	50	50	57
water (min)	34	32	36
Precipitation (in)			
Discharge (cfs)			
instant	.57	.75	6.4
crest stage	.57	set	9.5
Suspended sediment (ppm)			
	25	16	79
Chemical Character			
pH	7.50		7.50
ALK (CaCO ₃) (mg/l)	84		53
SC (µmhos)	162	148	99
TDS (mg/l)	105	86	64
Ca	24		19
Mg	8.7		4.9
Na	4.1		3.7
K	1.2		1.2
HCO ₃	102		64
SO ₄	3		2
NH ₄	.03		.15
NO ₃ & NO ₂ -N	.12		.04
PO ₄ (Ortho)-P	.040		.034
Biological Character			
Total Coliform (colonies/100 mls)	315	445	2220
Fecal Coliform (colonies/100 mls)	205	20	62
Stock present	n	n	n
			y
			u
			y
			8630
			1290
			y
			88
			2
			<.01
			.03
			.040

BASIC DATA RECORD

Station: Upper Nip & TuckLocation: S 33 T 11S R 14WWater Year: 1978Stream Reach Score: 94Survey Date: 9/1/76

Date	8/16	9/13
Time	1645	1045

Temperature (F°)

air	43	36
water	45	41
water (max)	70	64
water (min)	50	37

Precipitation (in)

Discharge (cfs)		
instant	.81	.84
crest stage	1.7	1.7

Suspended sediment (ppm)

	20	30
--	----	----

Chemical Character

PH	(8.53)	7.48
ALK (CaCO ₃) (mg/l)	80	75
SC (µmhos)	162	168
TDS (mg/l)	105	109
Ca	18	18
Mg	7.1	8.0
Na	3.3	4.2
K	1.1	2.4
HCO ₃	98	91
SO ₄	2	1
NH ₄ & NO ₃ -N	<.01	<.01
NO ₂	<.01	.06
PO ₄ (Ortho)-P	.086	.044

Biological Character

Total Coliform (colonies/100 mls)	6130	2730
Fecal Coliform (colonies/100 mls)	273	153
Stock present	u	u

BASIC DATA RECORD

Station: <u>North Divide</u>				Stream Reach Score: <u>82</u>			
Location: S <u>3</u> T <u>125</u> R <u>14W</u>				Survey Date: <u>9/1/76</u>			
Water Year: <u>1977</u>							
Date	5/30	6/16	6/28	7/14	7/27	8/30	9/28
Time	1030	1315	1200	1830	1145	1200	1430
Temperature (F°)							
air	53	54	64	66	61	50	57
water	44	54	56	59	58	44	50
water (max)	50	64	66	64	68	70	64
water (min)	32	37	41	39	46	39	36
Precipitation (in)	0.91	1.82	0.60	1.07	2.34	0.76	0.79
Discharge (cfs)							
instant	1.0	1.0	.50	.26	.56	.22	.30
crest stage	4.2	4.0	2.4	2.2	5.4	.56	.50
Suspended sediment (ppm)	16	18	14	10	6	27	14
Chemical Character							
PH	6.82		7.00		7.42	7.25	7.12
ALK (CaCO ₃) (mg/l)	16		(3.3)		18	23	21
SC (µmhos)	35	38	42	55	44	49	49
TDS (mg/l)	23	25	27	36	29	32	32
Ca	4.1		4.2		5.6	6.2	4.9
Mg	0.93		1.2		1.4	1.7	1.5
Na	1.8		2.0		2.1	2.3	2.3
K	0.88		0.87		1.1	1.2	1.1
HCO ₃	20		(4)		23	28	25
SO ₄	4		3		3	2	4
NH ₄	--		.05		--	<.01	.03
NO ₃ & NO ₂ -N	.01		<.01		.05	.13	.06
PO ₄ (Ortho) -P	.054		.035		.077	.078	.071
Biological Character							
Total Coliform (colonies/100 mls)	9		TNTC		960	1900	907
Fecal Coliform (colonies/100 mls)	7		TNTC	y	810	1540	859
Stock present			u		y	y	u

BASIC DATA RECORD

Station: <u>North Divide</u>		Stream Reach Score: <u>82</u>	
Location: <u>S 3 T 12S R 14W</u>		Survey Date: <u>9/1/76</u>	
Water Year: <u>1978</u>			
<u>Date</u>	<u>1977</u>	<u>1978</u>	<u>1979</u>
<u>Time</u>	<u>10/16</u>	<u>4/6</u>	<u>5/23</u>
	<u>1430</u>	<u>1400</u>	<u>2000</u>
<u>Temperature (F°)</u>			
air	63	44	40
water	47	36	37
water (max)	49	inst	53
water (min)	33	inst	32
Precipitation (in)	0.42	0.38	0.75
Discharge (cfs)			
instant	.26	.39	1.8
crest stage	.45	.56	1.9
Suspended sediment (ppm)	9	21	53
Chemical Character			
PH	7.00	6.59	6.40
ALK (CaCO ₃) (mg/l)	22	18	18
SC (µmhos)	47	42	36
TDS (mg/l)	31	27	23
Ca	5.5	6.3	4.8
Mg	1.4	1.6	1.1
Na	2.4	2.6	1.8
K	1.0	1.0	0.80
HCO ₃	26	21	22
SO ₄	3	2	2
NH ₄	.10	<.01	.02
NO ₃ & NO ₂ -N	.08	.05	.03
PO ₄ (Ortho)-P	.053	.034	.043
Biological Character			
Total Coliform (colonies/100 mls)	210	623	468
Fecal Coliform (colonies/100 mls)	125	373	264
Stock present	n	n	n

7 0.95

4.6
5.2

229

6.40

33
214.8
1.0
1.80.80
22
2.02
.03
.043

468

264
n

n

BASIC DATA RECORD

Station: <u>North Divide</u>				Stream Reach Score: <u>82</u>	
Location: <u>S 3 T 12S R 14W</u>				Survey Date: <u>9/1/76</u>	
Water Year: <u>1978</u>					
Date	6/1	6/13	7/1	8/16	9/13
Time	1145	1200	1645	1345	1200
Temperature (F°)					
air	45	58	61	55	40
water	41	50	55	51	44
water (max)	56	59	64	67	63
water (min)	32	39	37	42	38
Precipitation (in)	0.78	0.42	0.65	1.17	2.34
Discharge (cfs)					
instant	2.4	6.0	1.8	.39	.34
crest stage	5.7	8.4	4.0	1.0	≥.39
Suspended sediment (ppm)	29	47	28	22	27
Chemical Character					
PH					
ALK (CaCO ₃) (mg/l)				6.75	6.67
SC (μmhos)	36	27	37	21	21
TDS (mg/l)	23	18	24	34	48
Ca				22	31
Mg					
Na				5.5	5.2
K				1.1	1.2
HCO ₃				2.0	1.5
SO ₄				0.72	1.2
NH ₄				26	25
NO ₂ & NO ₃ -N				2	2
PO ₄ (Ortho)-P				<.01	<.01
				<.01	<.01
				.092	.055
Biological Character					
Total Coliform (colonies/100 mls)	777	2080		10000	2070
Fecal Coliform (colonies/100 mls)	20	1390		267	1060
Stock present	n	n	n	u	y

BASIC DATA RECORD

Station: South Divide				Stream Reach Score: 73			
Location: S 3 T 12S R 14W				Survey Date: 9/1/76			
Water Year: 1977							
Date	1976	1977	1977	4/23	5/3	5/13	5/20
Time	9/28	10/23	2/25	1300	1515	1815	1730
		1715	1715				
Temperature (F°)							
air		30	21	52	41	59	48
water		35	32	37	38	49	43
water (max)						inst	50
water (min)						inst	32
Precipitation (in)							
Discharge (cfs)							
instant	1.9	1.9	ice	1.1	1.1	1.2	1.1
crest stage		set	ice	set	1.4	1.4	1.4
Suspended sediment (ppm)							
		8	ice	15	15	16	18
Chemical Character							
PH							
ALK (CaCO ₃) (mg/l)				7.44			
SC (µmhos)				29			
TDS (mg/l)	59	58	65	57	56	58	57
	38	38	42	37	36	38	37
Ca				6.5			
Mg				1.7			
Na				1.9			
K				1.1			
HCO ₃				36			
SO ₄				1			
NH ₄				--			
NO ₃ & NO ₂ -N				.04			
PO ₄ (Ortho)-P				--			
Biological Character							
Total Coliform							
(colonies/100 mls)							
Fecal Coliform							
(colonies/100 mls)							
Stock present							

BASIC DATA RECORD

Station: <u>South Divide</u>				Stream Reach Score: <u>73</u>			
Location: <u>S 3 T 12S R 14W</u>				Survey Date: <u>9/1/76</u>			
Water Year: <u>1977</u>							
Date	5/30	6/16	6/28	7/14	7/27	8/30	9/28
Time	1100	1330	1230	1910	1215	1300	1400
Temperature (F°)							
air	51	55	68	63	64	43	54
water	41	49	50	56	50	45	41
water (max)	46	57	60	59	60	59	54
water (min)	32	34	38	39	41	39	36
Precipitation (in)							
Discharge (cfs)							
Instant	1.3	1.5	1.1	.81	1.0	.76	1.0
crest stage	1.9	2.7	3.0	1.9	3.8	1.0	1.2
Suspended sediment (ppm)	12	13	11	< 5	5	7	7
Chemical Character							
PH	7.13		7.20		7.43	7.53	7.20
ALK (CaCO ₃) (mg/l)	24		43		30	33	29
SC (µmhos)	55	52	68	55	59	60	60
TDS (mg/l)	36	34	44	43	38	39	39
Ca	7.2		7.2		8.2	7.7	7.4
Mg	1.4		1.6		1.9	2.0	2.0
Na	1.6		1.6		1.8	1.8	2.0
K	0.81		.067		.073	0.82	0.83
HCO ₃	31		52		36	39	35
SO ₄	4		2		3	1	3
NH ₄	--		.09		--	.01	.04
NO ₃ & NO ₂ -N	<.01		.39		.11	.13	.08
PO ₄ (Ortho)-P	.043		.032		.056	.054	.053
Biological Character							
Total Coliform (colonies/100 mls)	15		TNTC		1840	580	437
Fecal Coliform (colonies/100 mls)	10		TNTC		820	330	425
Stock present			u	u	u	u	u

BASIC DATA RECORD

Station: South Divide
 Location: S 3 T 12S R 14W
 Water Year: 1978
 Stream Reach Score: 73
 Survey Date: 9/1/76

Date	6/1	6/13	6/21	7/1	7/21	8/16	9/13
Time	1100	1100	1330	1715	1030	1315	1215
Temperature (F°)							
air	39	61	70	53	47	55	41
water	39	46	48	52	45	46	40
water (max)	50	58	54	57	59	59	54
water (min)	33	36	37	36	41	41	36

Precipitation (in)

Discharge (cfs)
 instant
 crest stage

4.9	11	8.2	5.4	3.2	1.9	1.6
6.4	12	11	8.6	6.2	3.2	2.0

Suspended
 sediment (ppm)

22	60	33	22	19	25	17
----	----	----	----	----	----	----

Chemical Character

PH
 ALK (CaCO₃) (mg/l)
 SC (µmhos)
 TDS (mg/l)
 Ca
 Mg
 Na
 K
 HCO₃
 SO₄
 NH₄
 NO₃-N
 PO₄ (Ortho)-P

42	35	6.79	47	6.85	6.94	6.75
27	23	18	31	21	28	29
		38		50	60	52
		25		32	39	34
		11		9.1	7.7	7.9
		1.6		1.8	1.4	1.6
		2.5		2.2	1.8	2.5
		0.67		0.56	0.48	1.7
		22		26	34	35
		1		2	1	1
		.02		.02	<.01	<.01
		.01		.03	<.01	<.01
		.044		.039	.069	.043

Biological Character

Total Coliform
 (colonies/100 mls)
 Fecal Coliform
 (colonies/100 mls)
 Stock present

653	550	7500	1400
65	115	1500	417
n	y	u	u

BASIC DATA RECORD

Station: Lower Jeff Davis

Location: S 12 T 11S R 14W

Water Year: 1977

Stream Reach Score: 65

Survey Date: 9/2/76

Date	1976	11/29	1977	4/16	5/3	5/13	5/20	5/30
Time	10/24	1545	2/25	1630	1630	1930	2015	1300
	1400		1815					
Temperature (F°)								
air	41	27	23	56	44	57	45	61
water	37	32	32	45	45	56	49	52
water (max)				inst	55	60	57	54
water (min)				inst	34	34	32	33

Precipitation (in)

Discharge (cfs)								
Instant	1.7	2.9	1.3	2.5	2.5	1.6	2.8	4.0
crest stage				set	3.4	2.8	4.0	4.8

Suspended sediment (ppm)

Suspended sediment	8	8	7	28	<5	6	25	10
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Chemical Character

PH								
ALK (CaCO ₃) (mg/l)								7.78
SC (µmhos)								73
TDS (mg/l)	208	215	188	170	178	197	200	178
	135	140	122	110	116	128	130	116
Ca								21
Mg								6.0
Na								4.7
K								1.4
HCO ₃								91
SO ₄								11
NH ₄								--
NO ₂ & NO ₃ -N								<.01
PO ₄ (Ortho)-P								--

Biological Character

Total Coliform (colonies/100 mls)								16
Fecal Coliform (colonies/100 mls)								11
Stock present								

BASIC DATA RECORD

Station: <u>Lower Jeff Davis</u>				Stream Reach Score: <u>65</u>			
Location: S <u>12</u> T <u>11S</u> R <u>14W</u>				Survey Date: <u>9/2/76</u>			
Water Year: <u>1977</u>							
Date	6/16	6/28	7/14	7/27	8/30	9/18	9/28
Time	1500	1330	2015	1345	1400	1800	1600
<u>Temperature (F°)</u>							
air	64	73	64	69	52	53	63
water	58	64	62	63	50	50	52
water (max)	61	59	66	70	68	64	52
water (min)	37	35	43	48	45	39	37
<u>Precipitation (in)</u>							
<u>Discharge (cfs)</u>							
instant	3.8	2.4	1.1	2.2	1.1	1.2	.98
crest stage	5.6	3.8	2.4	3.2	2.2	1.6	1.8
<u>Suspended sediment (ppm)</u>	15	10	8	<5	10	7	9
<u>Chemical Character</u>							
PH		7.84		7.90	7.81		7.75
ALK (CaCO ₃) (mg/l)		90		95	105		104
SC (µmhos)	165	175	190	172	208	206	214
TDS (mg/l)	107	114	124	112	135	134	139
Ca		21		26	31		34
Mg		6.6		7.8	9.3		10
Na		4.9		5.7	7.0		8.3
K		1.5		1.8	2.0		2.4
HCO ₃		110		116	128		127
SO ₄		5		8	7		9
NH ₄		.08		--	.01		.17
& NO ₃ -N		<.01		<.01	.09		.06
PO ₄ (Ortho)-P		.022		.060	.057		.053

BASIC DATA RECORD

Station: <u>Lower Jeff Davis</u>				Stream Reach Score: <u>65</u>	
Location: <u>S 12 T 11S R 14W</u>				Survey Date: <u>9/2/76</u>	
Water Year: <u>1978</u>					
Date	1977	1978		4/20	4/27
Time	10/16	11/11		1815	1130
	1700	1615			5/4
					1815
<u>Temperature (F°)</u>					
air	57	46		43	47
water	48	33		44	45
water (max)	52	48		49	49
water (min)	33	32		36	36
<u>Precipitation (in)</u>					
<u>Discharge (cfs)</u>					
instant	1.2	1.4	1.8	1.7	1.8
crest stage	1.4	1.6	set	2.3	1.8
<u>Suspended sediment (ppm)</u>					
	9	5	41	14	19
<u>Chemical Character</u>					
PH	7.50	7.60			7.55
ALK (CaCO ₃) (mg/l)	104	96			122
SC (µmhos)	206	189	175	240	225
TDS (mg/l)	134	123	114	156	146
Ca	30	27			29
Mg	9.1	8.6			8.7
Na	7.6	6.9			6.8
K	2.0	1.5			2.0
HCO ₃	126	117			147
SO ₄	6	6			6
NH ₄ & NO ₃ -N	< .01	< .01			.01
NO ₂	.07	.06			.02
PO ₄ (Ortho)-P	.038	.011			.027
<u>Biological Character</u>					
Total Coliform (colonies/100 mls)	4	43		470	
Fecal Coliform (colonies/100 mls)	4	36		< 10	
Stock present	n	n	n	n	n

BASIC DATA RECORD

Station: Lower Jeff Davis
 Location: S 12 T 11S R 14W
 Water Year: 1978

Stream Reach Score: 65

Survey Date: 9/2/76

Date	5/10	5/17	5/22	6/3	6/13	6/21	7/1	7/21	8/16
Time	1915	1345	2030	1130	1415	1245	1830	1200	1230
Temperature (F°)									
air	50	41	46	59	66	68	54	57	56
water	49	42	49	49	57	51	58	54	53
water (max)	53	66	set	set	60	60	62	68	66
water (min)	36	37	set	set	47	42	42	45	46

Precipitation (in)

Discharge (cfs)									
instant	3.4	2.8	11	6.4	9.2	5.0	2.9	2.0	1.2
crest stage	3.4	4.1	11	11	16	9.2	7.5	2.9	2.0

Suspended sediment (ppm)

	23	21	91	20	18	15	23	23	23
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Chemical Character

PH									
ALK (CaCO ₃) (mg/l)		7.75				7.45		7.85	7.95
SC (umhos)	219	95	162	152	131	67	166	88	105
TDS (mg/l)		109	105	99	85	83	108	116	132
Ca		22				24		22	24
Mg						7.0		7.3	7.6
Na		5.1				4.6		5.2	5.1
K		1.7				1.4		1.6	1.6
HCO ₃		114				80		107	128
SO ₄		6				5		6	6
NH ₄ & NO ₃ -N		.04				< .01		< .01	.03
NO ₂		.02				< .01		.03	< .01
PO ₄ (Ortho)-P		.027				.031		.051	.078

Biological Character

Total Coliform (colonies/100 mls)	263					1270		3170	2500
Fecal Coliform (colonies/100 mls)	1					9		67	180
Stock present	n	n	n	n	n	y	y	u	y

BASIC DATA RECORD

Stream Reach Score: 65
 Survey Date: 9/2/76

Station: Lower Jeff Davis
 Location: S 12 T 11S R 14W
 Water Year: 1978

Date 9/13
 Time 1345

Temperature (F°)
 air 50
 water 46
 water (max) 61
 water (min) 42

Precipitation (in)
 Discharge (cfs)
 instant 1.8
 crest stage 1.8

Suspended sediment (ppm) 15

Chemical Character
 pH 7.78
 ALK (CaCO₃) (mg/l) 93
 SC (µmhos) 212
 TDS (mg/l) 138
 Ca " 23
 Mg " 8.4
 Na " 5.8
 K " 2.4
 HCO₃ 113
 SO₄ 8
 NH₄ " <.01
 NO₃ & NO₂-N " <.01
 PO₄ 2 (Ortho)-P " .039

Biological Character
 Total Coliform (colonies/100 mls) 2330
 Fecal Coliform (colonies/100 mls) 57
 Stock present y

BASIC DATA RECORD

Station: <u>Upper Jeff Davis</u>		Stream Reach Score: <u>65</u>	
Location: <u>S 16 T 11S R 13W</u>		Survey Date: <u>9/2/76</u>	
Water Year: <u>1977</u>			
Date	1976	5/13	5/20
Time	9/28	1900	1945
			5/30
			1200
Temperature (F°)			
air	38	42	46
water	37	41	44
water (max)		48	50
water (min)		34	34
Precipitation (in)			
	inst	0.21	0.41
			1.72
Discharge (cfs)			
instant	2.3	1.7	1.4
crest stage	11	3.1	1.7
			2.1
			2.6
Suspended sediment (ppm)			
	15	< 5	6
			13
Chemical Character			
PH	7.82		7.64
ALK (CaCO ₃) (mg/l)	74		67
SC (µmhos)	157	157	149
TDS (mg/l)	102	102	97
Ca	15		17
Mg	6.4		5.7
Na	4.4		3.6
K	1.5		1.2
HCO ₃	90		84
SO ₄	6		9
NH ₄ & NO ₃ -N	--		--
NO ₂ (Ortho)-P	<.01		.07
PO ₄	--		--
Biological Character			
Total Coliform			10
(colonies/100 mls)			
Fecal Coliform			7
(colonies/100 mls)			
Stock present			

BASIC DATA RECORD

Station: Upper Jeff Davis Stream Reach Score: 65
 Location: S 16 T 11S R 13W Survey Date: 9/2/76
 Water Year: 1977

Date	6/16	6/28	7/14	7/27	8/30	9/18	9/28
Time	1415	1300	2000	1300	1330	1715	1515
Temperature (F°)							
air	57	77	67	70	44	62	53
water	51	56	57	59	48	50	49
water (max)	59	61	61	64	64	59	51
water (min)	37	41	41	47	41	39	36
Precipitation (in)	1.85	0.59	0.67	2.21	0.63	1.02	0.29
Discharge (cfs)							
instant	3.7	2.5	1.4	1.8	.96	1.4	1.3
crest stage	3.8	3.7	2.6	4.0	1.8	1.6	1.4
Suspended sediment (ppm)	11	16	< 5	28	6	7	< 5
Chemical Character							
PH		7.79		7.78			7.70
ALK (CaCO ₃) (mg/l)		66		72	71		74
SC (µmhos)	130	138	142	144	147	149	155
TDS (mg/l)	84	90	92	94	96	97	101
Ca		15		18	20		22
Mg		5.5		7.1	7.6		8.7
Na		3.2		4.0	4.7		5.8
K		1.0		1.3	1.5		1.8
HCO ₃		79		88	87		90
SO ₄		6		11	9		11
NH ₄		.04		--	.01		.18
NO ₃ & NO ₂ -N		<.01		.01	.10		.06
PO ₄ (Ortho)-P		.010		T	T		.008

Biological Character

Total Coliform (colonies/100 mls)	37	116	60	10
Fecal Coliform (colonies/100 mls)	32	116	40	6
Stock present	y	u	y	n

BASIC DATA RECORD

Station: Upper Jeff Davis		Stream Reach Score: 65	
Location: S 16 T 11S R 13W		Survey Date: 9/2/76	
Water Year: 1978			
Date	1977	1978	5/17
Time	10/16 11/11 1545	4/6 1130	5/10 1845 1230
Temperature (F°)			
air	58	42	42
water	46	37	39
water (max)	49	inst	56
water (min)	35	inst	32
Precipitation (in)	0.40	0.44	0.99
Discharge (cfs)			
instant	1.2	1.3	2.9
crest stage	1.3	1.6	4.5
Suspended sediment (ppm)			
	< 5	14	17
Chemical Character			
PH	7.32	7.51	7.67
ALK (CaCO ₃) (mg/l)	76	67	72
SC (μmhos)	153	148	134
TDS (mg/l)	99	96	87
Ca	22	20	14
Mg	8.1	7.8	6.1
Na	5.1	4.9	2.4
K	1.3	1.1	1.4
HCO ₃	93	82	86
SO ₄	9	8	5
NH ₄ & NO ₃ -N	--	.01	<.01
NO ₂ (Ortho)-P	.23	.05	.01
PO ₄	.004	T	.008
Biological Character			
Total Coliform (colonies/100 mls)	8	19	124
Fecal Coliform (colonies/100 mls)	4	18	1
Stock present	n	n	n

BASIC DATA RECORD

Station: Upper Jeff Davis

Location: S 16 T 11S R 13W

Water Year: 1978

Stream Reach Score: 65

Survey Date: 9/2/76

Date Time	5/22 1930	6/3 1100	6/13 1330	6/21 1215	7/1 1800	7/21 1130	8/16 1200	9/13 1315
Temperature (F°)								
air	54	58	64	69	54	--	54	44
water	45	45	53	50	55	50	48	45
water (max)	set	54	54	55	59	63	65	52
water (min)	set	33	38	37	38	41	43	38
Precipitation (in)	1.80	0.82	0.31	> 0.12	0.52	1.55	1.34	2.45
Discharge (cfs)								
instant	9.7	6.1	7.8	5.5	4.9	3.5	1.8	2.2
crest stage	9.7	13	13	8.0	5.5	8.0	3.5	2.3
Suspended sediment (ppm)	294	21	18	21	16	13	31	9
Chemical Character								
PH								
ALK (CaCO ₃) (mg/l)				7.25		7.75	7.25	7.53
SC (μmhos)	110	116	96	53		71	74	73
TDS (mg/l)	72	75	62	107	125	143	161	172
				70	81	93	105	112
Ca				18		16	18	17
Mg				5.8		6.7	7.1	7.4
Na				3.6		4.0	3.8	4.0
K				1.4		1.1	1.1	1.6
HCO ₃				64		86	90	89
SO ₄				6		6	5	6
NH ₄				.01		.01	.03	<.01
NO ₃ & NO ₂ -N				<.01		.02	.02	<.01
PO ₄ (Ortho)-P				.011		.014	.013	.006

Biological Character

Total Coliform
(colonies/100 mls)

Fecal Coliform
(colonies/100 mls)

Stock present

570	1130	867	970
17	59	81	43
n	n	u	u

BASIC DATA RECORD

Station: Lower Shenon
 Location: S 25 T 10S R 14W
 Water Year: 1977

Stream Reach Score: 88
 Survey Date: 9/2/76

Date 1976
Time
 10/24 11/29
 1600 1515

5/3 5/20 5/30
 1720 2115 1330

Temperature (F°)

air 41 28 61 45 55 36 66
 water 37 32 50 36 52 46 49
 water (max) 52 52 52 53 55
 water (min) 32 32 32 32 34

Precipitation (in)

Discharge (cfs)

instant 1.5 2.7 ice 2.1 1.2 1.0 1.3 n.s.
 crest stage 5.6 1.7 1.0 1.7 n.s.

Suspended

sediment (ppm) 25 27 59 3690 275 98 39 138 111

Chemical Character

PH
 ALK (CaCO₃) (mg/l) 8.02 7.95
 SC (µmhos) 298 118
 TDS (mg/l) 166 250 270 282 270 176
 Ca 22 28
 Mg 12 12
 Na 9.5 8.8
 K 2.4 1.8
 HCO₃ 141 148
 SO₄ 32 21
 NH₄ -- --
 NO₂ & NO₃ -N -- .01
 PO₄ (Ortho)-P -- .030

Biological Character

Total Coliform
 (colonies/100 mls)
 Fecal Coliform
 (colonies/100 mls)
 Stock present

TNTC

TNTC

BASIC DATA RECORD

Station: <u>Lower Shenon</u>				Stream Reach Score: <u>88</u>			
Location: S <u>25</u> T <u>10S</u> R <u>14W</u>				Survey Date: <u>9/2/76</u>			
Water Year: <u>1977</u>							
Date	6/16	6/28	7/14	8/30	9/19	9/28	
Time	1700	1500	2115	1600	1030	1715	
Temperature (F°)							
air	57	75	73	45	48	64	
water	55	62	63	48	42	50	
water (max)	68	68	68	70	63	53	
water (min)	38	41	46	43	36	32	
Precipitation (in)							
Discharge (cfs)							
instant	1.2	1.0	.85	.63	.63	.71	
crest stage	1.9	1.2	1.4	.85	.75	.85	
Suspended sediment (ppm)	143	70	13	21	10	8	
Chemical Character							
PH		8.05	8.19	7.89		8.11	
ALK (CaCO ₃) (mg/l)	133	133	133	125		128	
SC (µmhos)	273	257	256	267	265	272	
TDS (mg/l)	177	167	166	174	172	177	
Ca		29	28	32		34	
Mg		12	13	14		16	
Na		9.2	10	12		13	
K		2.1	1.9	2.1		2.1	
HCO ₃		162	162	153		156	
SO ₄		20	20	23		20	
NH ₄		.09	--	<.01		.14	
NO ₃ -N		<.01	.03	.09		.07	
PO ₄ (Ortho)-P		.019	.019	.022		.019	
Biological Character							
Total Coliform		TNTC	580	210		83	
(colonies/100 mls)							
Fecal Coliform		TNTC	740	205		73	
(colonies/100 mls)			y	y	y	u	
Stock present		y	u				

BASIC DATA RECORD

Station: Lower Shenon
 Location: S 25 T 10S R 14W
 Water Year: 1978

Stream Reach Score: 88Survey Date: 9/2/76

Date	1977	1978	4/6	4/13	4/20	4/27	5/4	5/10
Time	10/16	3/30	1030	1015	1915	1030	1900	2015
	1800	1430						
Temperature (F°)								
air	55	54	45	39	40	48	34	45
water	47	46	36	32	42	41	40	46
water (max)	51	inst	45	50	48	47	54	53
water (min)	32	inst	32	32	32	32	32	32

Precipitation (in)

Discharge (cfs)								
instant	.71	.88	.88	.92	.71	.71	.75	.92
crest stage	.71	set	1.8	1.7	1.7	.92	1.1	1.3

Suspended

sediment (ppm)	203	124	162	32	28	18	46
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Chemical Character

PH	7.70	7.90
ALK (CaCO ₃) (mg/l)	128	110
SC (µmhos)	271	252
TDS (mg/l)	176	164
Ca	36	34
Mg	16	15
Na	13	12
K	1.8	1.5
HCO ₃	156	135
SO ₄	21	16
NH ₄	.05	<.01
NO ₂ & NO ₃ -N	.05	.07
PO ₄ (Ortho)-P	.024	.007

Biological Character

Total Coliform	10	16
(colonies/100 mls)		
Fecal Coliform	35	17
(colonies/100 mls)		
Stock present	n	n

305

< 10

n

BASIC DATA RECORD

Station: Lower Shenon
 Location: S 25 T 10S R 14W
 Water Year: 1978

Stream Reach Score: 88Survey Date: 9/2/76

Date	5/17	5/23	6/3	6/13	6/21	7/1	7/21	8/16	9/13
Time	1530	1845	1230	1600	1130	1930	1330	1115	1530
Temperature (F°)									
air	41	49	61	71	70	51	59	54	50
water	42	52	48	61	51	59	55	50	48
water (max)	60	54	58	63	61	63	66	69	62
water (min)	34	41	34	40	39	41	45	45	40

Precipitation (in)

Discharge (cfs)	Instant	crest stage
.88	2.1	1.7
1.0	3.2	1.7

Suspended sediment (ppm)

Suspended sediment (ppm)	43	172	87	136	124	78	58	32	40
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Chemical Character

Chemical Character	PH	ALK (CaCO ₃) (mg/l)	SC (umhos)	TDS (mg/l)	Ca	Mg	Na	K	HCO ₃	SO ₄	NH ₄	NO ₃ & NO ₂ -N	PO ₄ (Ortho)-P
8.05	131	269	175	26	12	11	1.6	157	12	<.01	.02	.018	
8.05	232	151	235	153	37	13	9.4	142	5	.25	.03	.027	
8.00	118	232	151	146	13	12	2.2	153	17	.03	.02	.028	
8.05	125	263	171	26	29	13	1.5	167	20	.03	.02	.015	
8.24	137	272	177	26	13	9.5	1.2	127	22	<.01	<.01		
8.12	105	272	177	26	13	9.7	2.1	127	22	<.01	<.01		

Biological Character

Biological Character	Total Coliform (colonies/100 mls)	Fecal Coliform (colonies/100 mls)	Stock present
955	28600	13300	7270
83	1220	133	657
y	y	u	n
y	y	y	y
5130	5130	120	120

BASIC DATA RECORD

Station: Upper Shenon		Stream Reach Score: 88	
Location: S 33 T 10S R 13W		Survey Date: 9/2/76	
Water Year: 1977			
Date	1976	1977	
Time	10/24	4/16	
	1530	1715	
	11/29		
	1430		
Temperature (F°)			
air	41	28	
water	40	34	
water (max)			
water (min)			
Precipitation (in)			
	inst	inst	
Discharge (cfs)			
instant	1.0	1.1	
crest stage		1.8	
		set	
Suspended sediment (ppm)	11	8	
Chemical Character			
PH			
ALK (CaCO ₃) (mg/l)			
SC (µmhos)	222	224	
TDS (mg/l)	114	146	
Ca			
Mg			
Na			
K			
HCO ₃			
SO ₄			
NH ₄			
NO ₂ & NO ₃ -N			
PO ₄ (Ortho)-P			

Biological Character

Total Coliform
(colonies/100 mls)
Fecal Coliform
(colonies/100 mls)
Stock present

5

4

BASIC DATA RECORD

Station: <u>Upper Shenon</u>				Stream Reach Score: <u>88</u>		
Location: S <u>33</u> T <u>10S</u> R <u>13W</u>				Survey Date: <u>9/2/76</u>		
Water Year: <u>1977</u>						
Date	6/28	7/14	7/27	8/30	9/19	9/28
Time	1430	2045	1530	1530	1145	1645
Temperature (F°)						
air	73	54	73	37	52	59
water	56	50	57	43	45	47
water (max)	57	59	61	63	58	51
water (min)	32	36	43	41	37	37
Precipitation (in)	1.72	0.57	1.80	0.60	1.01	0.43
Discharge (cfs)						
instant	.69	.57	.57	.44	.38	.44
crest stage	.80	.69	1.1	.57	.44	.63
Suspended sediment (ppm)						
	107	16	9	8	15	< 5
Chemical Character						
PH	7.90		8.02	7.60		8.00
ALK (CaCO ₃) (mg/l)	119		120	115		116
SC (µmhos)	239	220	211	220	222	228
TDS (mg/l)	155	143	138	143	144	148
Ca	24		24	26		28
Mg	13		13	14		16
Na	6.9		6.9	7.2		8.5
K	1.1		1.1	1.2		1.4
HCO ₃	145		146	141		141
SO ₄	10		11	9		12
NH ₄	.08		--	<.01		.25
NO ₂ & NO ₃ -N	.08		.08	.07		.10
PO ₄ (Ortho) -P	T		.009	T		.002

BASIC DATA RECORD

Station: <u>Upper Shenon</u>		Stream Reach Score: <u>88</u>	
Location: S <u>33</u> T <u>10S</u> R <u>13W</u>		Survey Date: <u>9/2/76</u>	
Water Year: <u>1978</u>			
Date	1977	1978	1979
Time	10/16	4/6	5/17
	1745	1000	1445
Temperature (F°)			
air	52	40	39
water	46	36	37
water (max)	50	47	50
water (min)	34	32	32
Precipitation (in)	0.25	0.08	0.32
		inst	0.80
Discharge (cfs)			
instant	.44	.74	.69
crest stage	.44	set	.80
Suspended sediment (ppm)	< 5	< 5	12
Chemical Character			
PH	7.45		7.35
ALK (CaCO ₃) (mg/l)	120		115
SC (µmhos)	228		216
TDS (mg/l)	148		140
Ca	29		20
Mg	15		13
Na	8.4		7.0
K	1.3		0.73
HCO ₃	146		139
SO ₄	10		7
NH ₄	.11		.21
NO ₂ & NO ₃ -N	.06		--
PO ₄ (Ortho) -P	.006		.006
Biological Character			
Total Coliform	6	125	165
(colonies/100 mls)			
Fecal Coliform	6	< 10	23
(colonies/100 mls)			
Stock present	n	n	n

.02
.02
.009

